# Understanding and Being Understood

## The Impact of Intelligence and Dispositional Valuations on Social Relationships

DISSERTATION

zur Erlangung des akademischen Grades Dr. rer. nat.
im Fach Psychologie

eingereicht an der
Mathematisch-Naturwissenschaftlichen Fakultät II
der Humboldt-Universität zu Berlin

vorgelegt von
Jacobus J. A. Denissen, MA Psychology
geboren am 14. Februar 1978 in Udenhout, den Niederlanden

Präsident der Humboldt-Universität zu Berlin
Prof. Dr. Jürgen Mlynek

Dekan der Mathematisch-Naturwissenschaftlichen Fakultät II
Prof. Dr. Uwe Küchler

Gutachter
1. Jens B. Asendorpf, Humboldt-Universität zu Berlin
2. Alexandra M. Freund, Universität Zürich
3. Dan P. McAdams, Northwestern University

Eingereicht beim Promotionsausschuss am: 1. Juni, 2005
Tag der mündlichen Prüfung: 8. Juli, 2005

**Selbständigkeitserklärung**

Hiermit erkläre ich, die vorliegende Arbeit selbständig ohne fremde Hilfe verfasst und nur die angegebene Literatur und Hilfsmittel verwendet zu haben.

ἦθος ἀνθρώπῳ δαίμων
Man's character is his daimon[1]

HERACLITUS, FRAGMENT 119

[1] For the ancient Greeks, the daimon was non-human power somewhere between people and gods, without any negative connotations. An example would be the daimon of Socrates. The daimon had a wisdom that has nothing to do with our modern conceptions of good or evil: It was a force of nature that could offer hints about fateful situations and actions.

# Table of Content

# Index of Tables and Figures

# Introduction

The current dissertation investigates the association between personality (in the case of the current dissertation: intelligence and dispositional valuations) and people's ability to understand each other's thoughts and feelings (mutual understanding). If there is any association between a personality trait and a certain phenomenon, then the consequences of the underlying process should be most readily apparent in people with extreme values of this trait. Thus, it can be useful to focus on extreme groups in order to understand the mechanism behind such an association. Regarding the link between intelligence and mutual understanding, the following debate about intellectual giftedness, which appeared in the online version of the Dutch *Volkskrant* newspaper (in November 2001), is a case in point. One participant, who apparently had a critical view of gifted individuals, posted a comment stating that "[…] gifted people live 'in their own world'." He went on to say that "Often, the social isolation is even exacerbated by a lack of empathy for fellow human beings, which often gives rise to arrogance (people are stupid, cannot think, etc.)". One reader, apparently someone with first-hand experience, reacted:

> You have no idea what you are talking about. Being gifted is not about […] choosing deliberately to be socially awkward. Giftedness comes closer to trying your very best for years to participate in small-talk but just not being able to succeed. After every spontaneous effort, people look surprised and depreciate you as being a weirdo, nerd, or dork, just because you think the typical social conversation is too trivial to come up with an appropriate contribution. So that leaves only two options: Either you think three times how to say something in order to belong to the group, or you just keep quiet and remain silent in a corner. I hope you understand that a computer or a good book are a lot more pleasant than these two other options.

Of course, this discussion is dominated to a large degree by stereotypes and untested assumptions. Yet in a nutshell, it captures all the questions of the current dissertation. The first commentator (so it seems) addresses a so-called main effect: According to this individual, there exists a generally negative association between a person's intelligence and his or her empathic skills. In defense, the second commentator

points to the existence of dyadic effects, which are dependent on the interplay between two interaction partners. In his opinion, gifted people suffer from a mismatch between their interests and those of most other people. The current dissertation addresses these questions more systematically. In contrast to the opinion of the first commentator, a model by Simonton (1985) hypothesizes that intelligence is positively associated with the ability to understand other people. Like the second commentator, however, the model also assumes that between-person differences in intelligence limit the ability of the more intelligent person to make him- or herself understood. Putting this model to the test, it is first investigated whether intelligence and dispositional valuations exert a main effect on people's ability to establish a sense of mutual understanding. Second, it is tested whether differences between interaction partners in terms of these traits influence their ability to communicate their thoughts and feelings. Third, the question is asked what the combined influence of main and dyadic effects is in an extreme group of intellectually gifted individuals.

Before I go on to address these questions, my thanks go out to many people and institutions. First of all, I wish to thank the Max Planck Institute for Human Development in Berlin and the Dutch Prins Bernhard Cultuurfonds for providing me with the necessary funding to complete this research. I am also indebted to Jacque Eccles and Alexandra Freund for commenting on earlier versions of this thesis, and to Susanne Scheibe who skillfully and conscientiously acted as its proof reader. Thanks also go to Alain May, who collected the data of Study 1.II for his master's thesis, and to my former student assistants Benjamin Bornschein, Wenke Burde, and Katherina Flaig, who helped me in collecting and evaluating the data of Study 4. Also, I greatly benefited from conversations with my colleagues at the department of Personality Psychology at Humboldt University: Rainer Banse (now at the University of York), Judith Lehnart, Franz Neyer, Lars Penke, and Cornelia Wrzus. And of course, I do not want to forget the participants in my studies, who allowed me to analyze their responses to the many questions I asked them. Finally, I wish to thank my advisor Jens Asendorpf for his loyal support, his insightful comments on the products of my scholarship, and his inspiring guidance as a mentor.

I dedicate this work to Claudia, who put up with my long working hours and acted as an inexhaustible source of emotional support whenever I needed some.

# 1 Understanding and Being Understood

As stated in the introduction, the current dissertation focuses on the influence of intelligence traits and dispositional valuations on understanding and being understood. The first chapter has two objectives. The first section (1.1) provides a description and definition of mutual understanding. Because there has not been much past research specifically focusing on this construct, findings from neighboring fields are discussed to establish the discriminant validity of mutual understanding within a larger nomological network of related constructs. Second, Section 1.2 provides an analysis of the linguistic and social processes underlying mutual understanding. This will set up a framework for Chapter 2, in which the mechanisms by which intelligence and dispositional valuations influence these distinct mechanisms are discussed.

## 1.1 Mutual Understanding

### 1.1.1 Description and Definition

> In the experience of a conversation, a common ground constitutes itself between the other one and myself, my thought and his make up a single tissue, my words and his are called out by the phase of the discussion, they insert themselves in a common operation of which neither one of us is the sole creator.

This quote by the French phenomenologist Merleau-Ponty (1945, cited in Bernieri, Gillis, Davis, & Grahe, 1996, p. 114) describes the very distinct experience of conversational harmony: the finding of „common ground". The current dissertation focuses on this process of mutual understanding (MU) between two persons. MU is defined here as the successful communication of personally relevant thoughts and feelings between interacting individuals. Thus, MU requires both interaction partners to understand each other and this understanding needs to pertain to personally important thoughts and feelings.

The current study focuses on mutual understanding within pairs of individuals (dyads). Such dyadic relationships seem to have a high potential for mutual understanding. In fact, many distinctive, „personal" relationships, such as romantic couples or close friendships, are defined by a dyadic focus. By focusing on dyads, the current approach precludes social support processes in groups or communities (for an analysis of intimacy processes in small groups, see Barker, 1991).

### 1.1.2 Concepts Related to Mutual Understanding

Despite its intuitive appeal, very little research explicitly focuses on MU as a psychological construct. Partly, this is due to the separateness of the disciplines of psychology and communication research in academic curricula and research. Nevertheless, research addressed several constructs that are related (though not identical) to MU. In the following section, research regarding four such constructs is reviewed: empathy, social support, rapport, and intimacy. This research can serve to clarify the theoretical background and discriminant validity of MU as a psychological variable.

#### 1.1.2.1 Empathy

Empathy is often described as the ability to put oneself into another's "shoes". According to Neyer, Banse, & Asendorpf (1999, p. 419-420), this is defined by such processes as taking the situational perspective of the other, recognizing what the other is thinking, detecting the intentions and motivations of the other, and intuitively understanding the emotions of the other. Because of this focus on the recognition and understanding of other people's emotions and feelings, empathy is closely related to MU.

Research on empathy has found that people are not very good at evaluating their own level of empathic skills (Davis & Kraus, 1997; Realo et al. 2003). For this reason, researchers have shifted their emphasis on assessing empathy as an observable phenomenon within the context of social relationships (Neyer et al., 1999). For example, Ickes (1993) has established a paradigm that focuses on people's ability to predict what their interaction partners are thinking or feeling (i.e., mind reading). When applied to a conversation between two people, this ability should facilitate the understanding of the intentions behind verbal utterances. Accordingly, empathic accuracy should be positively related to MU.

In spite of these communalities, there exists an important difference between MU and empathy. Most studies on empathic accuracy have used individualistic designs. For example, they have looked at the association between participants' personality traits and their empathic accuracy scores to identify features of "the good judge" (Davis & Kraus, 1997). Alternatively, studies have looked at features of target persons that are associated with a greater ease for others to "read their minds" (e.g., Thomas & Fletcher, 2003). In contrast, MU is a phenomenon that is neither limited to the abilities of the judge, nor to the understanding of the target. Rather, MU is an emergent phenomenon that it requires both members of a dyad to understand each other: It is both about understanding *and* being understood. As will be elaborated in Chapter 2, this is important because it can be hypothesized that intelligence enhances the ability to understand other people yet at the same time limit the possibility to be understood by others.

#### 1.1.2.2 Social Support

People differ in the quality and quantity of their social relationships. Some individuals have a very large number of acquaintances and friends, whereas others concentrate their energy on a selected few. Moreover, the quality of relationships varies from loving, reciprocal, and caring to envious, disrespectful, and abusive. There exist a number of different definitions of social support. For example, Albrecht and Adelman (1987, p. 19) define social support as:

> verbal and nonverbal communication between recipients and providers that reduces uncertainty about the situation, the self, the other, or the relationship, and functions to enhance a perception of personal control in one's life experience.

When people feel understood by each other, this may act as a validation of their worldviews (Byrne, 1971), reduce their existential uncertainty, and enhance their perceptions of personal control (Mikulincer, Florian, & Hirschberger, 2004). For this reason, MU could be regarded as a specific form of social support (Keeley & Hart, 1994). However, social support is a much broader construct that includes behaviors such as practical advice, financial assistance, and comforting people (for a categorization of social support behaviors, see Cohen, Underwood, & Gottlieb, 2000; Vaux, 1992). In contrast to

social support, which can involve broad array of behaviors, MU is more specific since it requires that two individuals are able to accurately communicate their thoughts and feelings. In the words of Duck (1994, p. 5),

> […] *understanding* (of what is meant) and *sharing of meaning* […] are essential elements of relating and […] everyday talk is part of the system of communication that creates them both.

#### 1.1.2.3 Rapport

Rapport is described by Webster's Ninth New Collegiate Dictionary (1983, cited in Bernieri et al., 1996) as a relational quality „marked by harmony, conformity, accord, and affinity." Because rapport does not reside within individuals, it is essentially a dyadic phenomenon (i.e., the product of social interactions). According to Tickle-Degnen and Rosenthal (1990), rapport consists of three qualities: coordination, mutual attentiveness, and positivity. Coordination refers to a responsive pattern of behavioral give and take, which is associated with behavioral synchrony (the coupling of interpersonal behavior patterns). Attentiveness refers to a joint focus of attention; without mutual attention, there can be no meaningful contact. Finally, positivity refers to an interpersonal atmosphere characterized by positive emotions, such as joy and happiness.

Although rapport is a useful construct to describe harmonious interactions, the causal relations between the construct and its constitutive components are far from clear. There are three possibilities. First, coordinated, mutually attentive and positive behavior may automatically lead to rapport. If so, then rapport would also result if an individual engages in slavish yes-nodding to everything his or her interaction partner says. Second, reversing the causal chain, it may be that rapport *causes* coordinated, mutually attentive and positive behavioral interactions. Third, it might be that rapport is simply a cognitive-representational correlate of a broader sensation of „being in tune".

Niederhoffer and Pennebaker (2002) recently argued that coordination and mutual attentiveness might not be essential characteristics of rapport, since they also occur in highly negative interactions (e.g., people focusing and reacting to each other during a fight; see Cairns & Cairns, 2000, p. 413, for similar arguments). In addition, people may share negative or sad information but still establish a sense of rapport when there is an atmosphere of acceptance and respect. Because most laboratory studies (for obvious ethical

reasons) focus on neutral or positive interactions, the role of coordination and attentiveness in negative interactions is unclear.

Rapport is similar to MU in that both refer to a positive, dyadic quality of social interaction. Indeed, the coordinated and mutually attentive rapport behaviors are likely correlated with the conversational harmony implied in the process of MU. In terms of their causal primacy, however, it seems more plausible that rapport is a result of MU rather than the other way around. Specifically, being understood by another individual likely validates one's world-view and should lead to positive emotions of rapport (Byrne, 1971). However, the reverse is not necessary the case: Whereas rapport seems to pertain to all positive, coordinated and mutually attentive social interaction, MU refers only to interactions that involve the successful communication of personally significant thoughts and feelings.

#### 1.1.2.4 Intimacy

A fourth possible correlate of MU is intimacy. Reis (1990) defined intimacy as a process that begins when a person expresses personally revealing feelings or thoughts to another person. For the intimacy process to continue, it is required that the listener responds supportively and emphatically. Ideally, this leads the discloser to feel understood, validated and cared for. Intimacy can be an important source of social support (Reis, 1990; Johnson, Hobfoll, & Zalcberg-Linetzy, 1993). It has also been shown to be a highly valued characteristic of friendships. For example, Caldwell and Peplau (1982) asked respondents whether they would prefer having a limited number of very intimate friends over having many good but less intimate friends. Confronted with this dilemma, no less than 73% of the men and 83% of the women preferred having a limited number of intimate friends.

The behaviors that are associated with intimacy vary according to gender and culture. In Western, individualistic societies, self-disclosure seems to be central to intimacy, but in many non-Western, collectivistic societies, caring, intimate relationships with members of the social group may so normative that they do not require the sharing of personal thoughts and feelings (Adams, Anderson, & Adonu, 2004). Furthermore, it has been established that women engage in intimate behaviors more than men do, even though both sexes have similar representations of what constitutes intimacy (Fehr, 2004).

MU and intimacy are conceptually similar. For example, Fehr (2004) asked respondents to rate how prototypical several behaviors are for the construct of intimacy in friendships. Items that received the highest ratings mostly pertained to the sharing of

cognitive and emotional content. Indeed, the most prototypical item was: „If I need to talk, my friend will listen.“ This focus on disclosing personally relevant information and its understanding and validation by the interaction partner closely matches the construct of MU.

In spite of much communality, there is also an important difference between MU and intimacy. The concept of intimacy is closely associated with the notion of caring, loving relationships. In contrast, it is possible to experience MU in the absence of such emotions. Indeed, sometimes, very powerful experiences involve meaningful conversations with strangers encountered during a walk through the park, on vacation, etc. At the end of such meetings, one is left with the feeling of „having so much in common”. Although such interactions involve a high degree of MU and validation, they do not necessarily imply a caring for the other person.

A case can be made that MU is a central first step in establishing intimacy. According to this logic, meeting a person who is truly understanding of one’s deepest thoughts suggests the existence of a parallel worldview in the other individual: It affirms the validity of one’s own thoughts and feelings (Byrne, 1971). When both persons share this sense of being understood, a feeling of MU has set in, which may then motivate them to establish more regular contact and continue to explore the compatibility of each other’s worldviews. After some time, amicable feelings and/or romantic emotions might evolve that give rise to the „caring” component of intimacy.

The hypothesized associations between MU, worldview validation, and interpersonal care are supported by empirical research. In a diary study, Reis, Sheldon, Gable, Roscoe, and Ryan (2000) followed 67 participants for 2 weeks. Each day, participants compiled a list of their three most time-consuming social activities. They rated whether these activities involved talking about meaningful matters, a feeling of being understood, and the amount of relatedness experienced in them. As predicted, talking about meaningful matters and feelings of being understood were strongly related to well-being. Similarly, Murray, Bellavia, Dolderman, Holmes, and Griffin (2002) showed that the feeling of being understood in a relationship is closely related to relationship satisfaction, and Snyder (1979) found that measures of communication quality were the best single predictors of global marital satisfaction. Thus, there is some evidence that MU is a crucial element in the establishment of satisfying, caring relationships.

## 1.2 Communicating Meaning

As stated above, the current dissertation focuses on MU in verbal interactions between two individuals. Recalling the definition given above, this requires the successful communication of personally relevant thoughts and feelings. However, although this definition may be useful for descriptive purposes, it does not specify the mechanisms by which people achieve this successful communication. How are people able to accurately share their thoughts and feelings? Only if this question is answered can theoretical predictions regarding the impact of intelligence and dispositional valuations be derived.

Experience sampling research has found that students spend about 6 hours per day (or about 40%) in conversations with other people (Reis & Wheeler, 1991). Thus, language plays a major role in social life. Surely, individuals can also develop a sense of „wordless" understanding of each others' thoughts and emotions. For example, nonverbal behavior has been demonstrated to be a rich source of interpersonal information and sometimes outperforms spoken language in its level of directness (Ekman, 2003). However, nonverbal behavior also seems somewhat limited in its potential to communicate more complex thoughts and feelings. Indeed, the impact of verbal and nonverbal behavior on communication effectiveness has been shown to be additive and complementary (Jones & Guerrero, 2001).

In a very general sense, language is a system of signs. For a better understanding of the mechanism by which verbal communication acquires its meaning, it is helpful to investigate some basic features of signs. Semiotics is the philosophical tradition that studies the way in which signs acquire their meaning. According to the semiotician Ferdinand de Saussure (1916), a sign consists of two elements (see Figure 1). The *signifier* refers to the form of the sign, which in the context of conversations is the acoustic pattern of an utterance (e.g., the sentence „watch out for that dog"). In turn, the *signified* implies that the sign must refer to some material or conceptual reality. In the dissertation, this referential reality is mainly is mostly thought of as people's life experiences (e.g., seeing and hearing a barking dog).

These two sign elements are connected by semiotic *codes* (depicted by a double-headed arrow in Figure 1). Codes can be defined as *procedural systems of related conventions for relating signifieds to signifiers*. The fact that codes are conventions implies they are socially constructed: In language, there is no „objective meaning" of an utterance. According to Jakobson and Halle (1956, p. 72), „the efficiency of a speech event demands

the use of a common code by its participants." For example, in southern Germany, people greet each other with the words „Grüß Gott", which literally means „greet God". By means of a shared code, people from this region know that this is just a common way to say „hello". The next section tries to elucidate some of the mechanisms used to achieve this agreement.

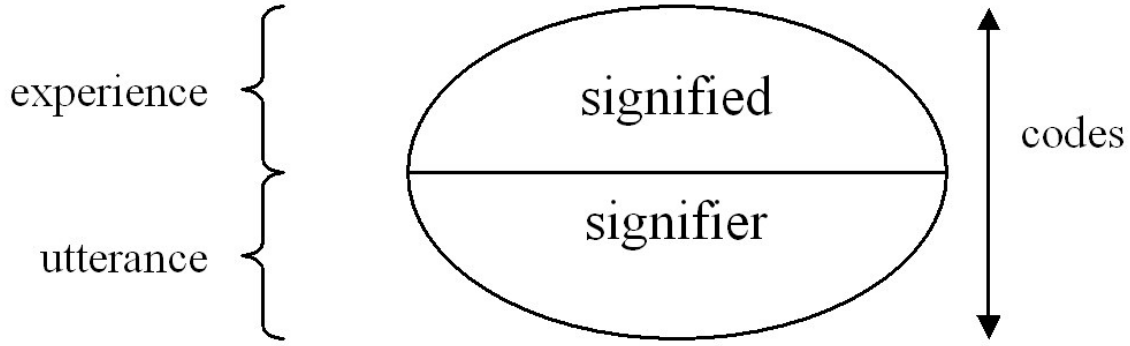



*Figure 1*. Schematic Depiction of Sign Elements According to de Saussure (1916).

*Note*. A sign is constituted of a *signified* (a reference to some experiential reality) and a *signifier* (a material form, such as the sound pattern in spoken language). Interpretative *codes* are conventions that govern the association between these two elements.

### 1.2.1 A Model of Dyadic Communication

To further clarify the MU process and its different constituents, I created a dyadic communication model based on de Saussure's (1916) semiotic principles. Figure 2 depicts five crucial steps in the application of this model to the interaction between two persons, Person A and B. The model is based on the assumption that both persons have their own unique experiences. For example, A might have experienced a dangerous situation while driving on the highway, whereas B has not. These differing experiences are associated with differences in the content of thoughts and feelings (the different *signifieds* in the upper and lower layer of the figure).

In the figure, Person A starts with a thought or feeling X he or she wants to communicate with B (e.g., the opinion that highways are unsafe nowadays). In order to do this, he or she needs to encode X into a verbal utterance (step 1) that is left for B to decode (step 2). For example, A might state „I can't believe how dangerous highways have

become these days". When both persons share the same linguistic code (S), this process leads to the creation of a comparable thought or feeling (X')[1] in Person B.

Sometimes A and B will use idiosyncratic codes that are not shared between them. Such codes are called *idiolects* (iA and iB). When communication between A and B involves idiolects, Person B's interpretation of the message does not match the intentions of Person A (e.g., B might think that Person A does not actually *believe* the fact that traffic is unsafe). This is referred to by Umberto Eco (1965) as „aberrant decoding", which may give rise to serious interpretational difficulties, especially when the differences in code use are not made transparent.

Single-utterance interactions are the exception in human communication. In most cases, a decoded meaning (in the current example: X') will lead to the activation of another thought or feeling (Y). This probably takes place by an associative mechanism (step 3). For example, the construct „highway" might activate a thought or feeling related to the construct „road". Although this process is dependent on deterministic brain activity, the effect of subtle situational influences and the interaction of numerous neurophysiological parameters make its outcome highly chance-dependent. For example, if B had previously talked to his or her neighbor who drives a Mercedes-Benz, it becomes more likely that a corresponding image is activated.

When B has acquired a sense of what to reply, the cycle of encoding the thought into a sound pattern continues (step 4). For example, Person B might reply: „Some people think the road belongs to them; like my neighbor C." After this, Person A must decode the message (step 5) and come up with a relevant association to continue the interaction (provided the motivation to continue communicating is still high enough). Such a reaction might consist of questioning aspects of the previous utterance in order to gain a clearer sense of its meaning (e.g., „Did your neighbor ever have an accident?"), leading to a clarification phase of the conversation.

[1] Because it is unlikely that every aspect of the interpretative code is identical between the two persons, the signified X of Person B will always differ somewhat from that of Person A (hence the added apostrophe).

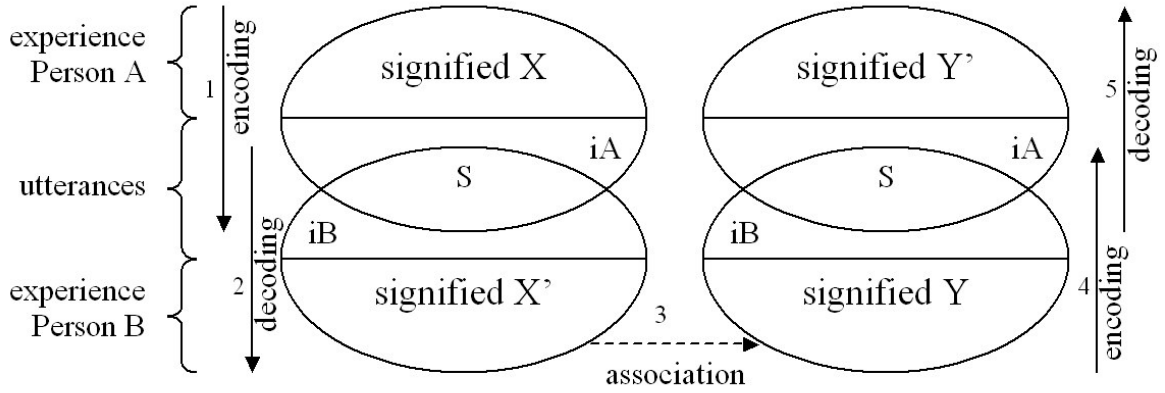



*Figure 2*. Schematic Depiction of the Dyadic Communication Process

*Note*. Dyadic communication is seen as a process involving five steps. When Person A wants to communicate a thought or feeling X to Person B, he or she must encode it into a verbal utterance (step 1). Following this, B must interpret this utterance (step 2). When Person A and B use idiolects that are not shared (iA and iB), this process is hampered. Instead, when both persons use the same linguistic code (S), this leads to the creation of a comparable thought or feeling X' in Person B. When B wants to continue the communication, he or she must produce a related thought or feeling Y through an associative process (step 3). After this, Person B must decode it into a verbal utterance (step 4) that Person A needs to decode (step 5), and so forth.

### 1.2.2 Social Construction of Shared Codes

Speaking the same language is one prerequisite for effective communication because it provides people with fixed rules for the interpretation of syntactic structures and the meaning of words and proverbs. However, because of the generativity of language, such an *a priory*, culturally universal code does not exist for the interpretation of more complex utterances. For the interpretation of more complex utterances, interacting individuals often have to *actively construct* shared codes.

In the following section, four techniques for the social construction of shared codes are discussed: audience design, perspective taking, reference to shared experiences, and metaphors (see Table 1 for a summary and description). It is important to note that these codes are not independent of each other. Rather, they serve as an interrelated whole in which the different elements may facilitate or compensate each other. For example, perspective taking is a necessary requirement for effective audience design.

Table 1

*Summary of Four Techniques for the Social Construction of Shared Codes*

| Technique | Working ingredient | Example |
|---|---|---|
| Audience design | Adjusting communication according to the observed reactions of the interaction partner | [A:] „The earthquake measured nine on the Richter scale."<br>[B, silence, looking confused]<br>[A, sensing B doesn't know the Richter scale:] „It was a very heavy earthquake." |
| Perspective taking | Using the presumed mental state of the interaction partner to communicate and infer meaning | [A:] „How are you doing?"<br>[B, looking sad:] „I'm OK".<br>[A:] „Is something the matter?" |
| Shared experiences | Drawing on past experiences with the interaction partner to communicate and infer meaning | [A:] „Hush, you know how angry dad can get when we wake him up."<br>[B:] „You're right, I'm sorry." |
| Metaphors | Using shared concepts to describe nonshared concepts | [A:] „Have you ever tasted Tabasco sauce?"<br>[B:] „No."<br>[A:] „It's like an extremely hot kind of salsa sauce". |

#### 1.2.2.1 Audience Design

Central to the notion of audience design is the idea that people are different from each other. An utterance such as „The ANOVA did not result in a significant interaction effect" might be perfectly understandable for a research psychologist but completely obscure to the average layperson. Because of this, speakers need to tailor their message to the needs of their audiences (Krauss & Fussell, 1991). If the audience lacks the necessary code to interpret a specific utterance, then the speaker needs to explain a construct in more detail (e.g., by pointing out that an ANOVA is a statistical technique to find out if an effect is meaningful).

Adjusting a message according to the perceived knowledge of the interaction partner is called *audience design*. According to Clark (1992), audience design depends on

an effective „grounding process": the initial phase of a conversation in which individuals establish a shared set of codes (common ground). Clark and colleagues (Clark, 1992; Wilkes-Gibbs & Clark, 1992) state that the grounding phase is a collaborative process in which both participants work together to understand the meaning of each other's utterances. According to their collaborative model, common ground is established when an interaction partner presents some information to the other person (presentation phase), and the partner provides some evidence of his or her understanding of this information (acceptance phase). When mutual understanding of the information is thus demonstrated, it becomes part of the interaction partners' shared knowledge.

Indirect evidence for the notion of audience design comes from research on so-called referential communication tasks, in which people need to describe referential objects to another person. For example, it has been consistently shown that across time, speakers reduce the number of turns and words used to identify these referential targets to others (e.g., Fussell & Krauss, 1992; Wilkes-Gibbs & Clark, 1992). Probably, the establishment of common ground during the conversation reduces the need for additional clarifying information to comprehend its meaning.[2] For example, Nohara-LeClair (2001) found that individuals who know the meaning of a set of stimuli share this knowledge with each other and became more accurate at estimating how much their partners knew about the stimuli during the course of an interaction.[3]

#### 1.2.2.2 Perspective Taking

An important technique in encoding and decoding verbal communication is perspective taking (Krauss & Fussell, 1991). Consider the sentence „Can you open the door?" This sentence can refer to properties of the door (can it be opened?), properties of the person that is spoken to (is the person physically able to open the door?) or contain a request to that person („please open the door"). The receiver is left with a knowledge gap

[2] According to Clark and colleagues' *principle of least collaborative effort*, people reduce their language output because they want to minimize „the work both speakers and addressees do from the initiation of the referential process to its completion" (Clark and Wilkes-Gibbs, 1986, p. 26).

[3] In spite of this accuracy, there is also a persistent tendency to overestimate the amount of shared knowledge (see Fussell & Krauss, 1992; Nohara-LeClair, 2001).

that poses a hindrance in the interpretation of the message. One of the ways this knowledge gap can be bridged is by taking the *intention* of the speaker into account.

According to Tomasello (2000), humans differ from other primates by their highly developed understanding of other individuals as intentional beings. After 9-12 months of age, human infants begin to engage in joint attentional schemes with adults, which gradually enable them to take the perspective of others into account. From this understanding of other individuals as intentional agents follows a gradual awareness of others-as-mental-agents, that is, as beings with distinct psychological states and motives (Wellman, 1990).

As stated above, perspective taking can be an important tool in the grounding process of audience design. When individuals know what kind of knowledge their interaction partners *probably* possess, they can more effectively tailor the content of their utterances. According to Clark and Marshall (1992), people use information from three sources to infer the amount of shared knowledge. First, they can rely on cues that are located in the shared perceptual/physical environment of the conversation partners (e.g., talking about „that car over there“ while pointing at it). Second, they can use linguistic cues derived from the past and present conversations between the interaction partners. Finally, people can infer shared knowledge from *community membership* information by relying on assumptions about the things known to members of certain social groups (see the example above about the use of the term „ANOVA” and „interaction effect” in a discussion between two psychologists).

Empirical support that people use their assessment of other persons' perspectives when adjusting their communication comes from multiple experimental studies. For example, Fussell and Krauss (1992, experiments 2 and 4) let participants judge the recognizability of diverse stimuli and then used these stimuli in a referential communication task. Consistent with the idea that people take their interaction partner's perspective into account, participants used significantly more words and conversation turns when the stimulus in question was less familiar.[4]

[4] This is not to say that perspective taking was always perfectly successful. When participants themselves were familiar with a certain stimulus, they systematically overestimated the probability that their partners would also be familiar with the stimulus. Such egocentric tendencies likely reduce the effectiveness of interpersonal communication.

#### 1.2.2.3 Shared Experiences

A third mechanism that can serve to create a shared communicative code is reliance on shared experiences.[5] According to psychologist Steven Duck (1994), human beings generate meaning by „anticipating how things will repeat themselves" (p. 65; also see Kelly, 1955). According to Duck, it is necessary to grasp the nature of these anticipations to really understand another person. However, the communication of meaning is complicated by the fact that persons often see the world in a highly idiosyncratic way. Because individuals' anticipations are not observable to the interaction partner, the degree to which they are understood depends on the listener's ability to interpret utterances and fill in knowledge gaps.

In Duck's theory, people discover similarity in their anticipations of events through everyday talk, in which „the framework of a person's thought is presented to others symbolically so that the two partners may, if they are able, detect, recognize, create, and respond to similarities of interpretation of the world" (p. 14). Similarity on a particular topic is one way to establish a common ground on which people are more able to comprehend and communicate with each other. Moreover, similarity in the evaluations of these experiences may act as a reassurance that one's personal worldview is shared by others and thus strengthen the person's belief in its accuracy and validity.

One way in which shared experiences foster effective communication is that similar persons can effectively use information on their own states and personality to make valid inferences about the other person (Neyer et al., 1999). In a way, such shared experiences may be seen as a specific instance of perspective taking: When people share a large number of experiences, it is easier to take the other person's perspective.[6] An example of the process of meaning sharing is depicted in Figure 3. In phase I, persons A and B have both experienced event X, which has been incorporated in their respective personal

[5] Indeed, the very meaning of the word communication is derived from the Latin *communicare*, which means „to make common or shared".

[6] Another source of accurate inferences is relationship-specific „theories": mental models containing interaction-specific knowledge (Baldwin, 1992). Such mental models are hypothesized to serve as a basis for the interpretation of other persons' behavior and might be created through mutual self-disclosure (Colvin, Vogt, & Ickes, 1997; Thomas & Fletcher, 2003).

construct systems (vertical lines from A and B to X). However, in this first phase, they are not yet aware of this similarity. In the second phase, A and B disclose their mutual experience of X but do not yet talk about the meaning of this particular experience (horizontal arrow between the X of A to the X of B). In the third phase, they start to talk about their evaluation of X and discover that this event has approximately the same meaning for them (shared access of A and B to X's meaning). This motivates them to further engage in conversation about the meaning complexes associated with X, such as N or Z. In Figure 3, these associated meanings are also shared, which is likely to stimulate their conversation and promote mutual feelings of being understood.

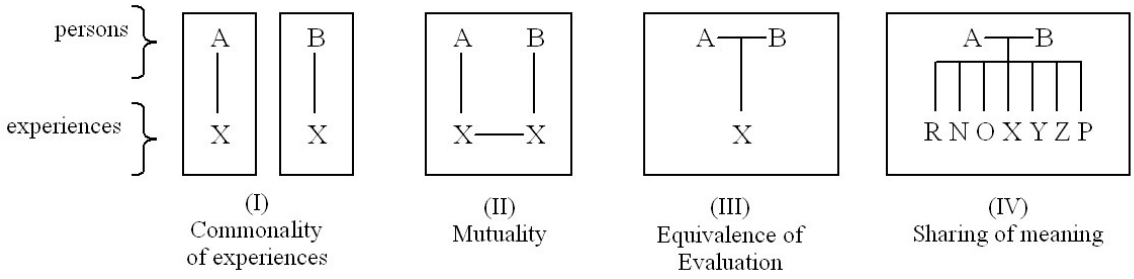



*Figure 3*. Model of the Serial Construction of Meaning According to Duck (1994)

*Note*. According to Duck (1994, slight modifications added), individuals relationships between two persons (represented as A and B) are facilitated by shared experiences. In everyday talk, people may become aware of (1) mutuality in experience (2) and equivalence of evaluation of this experience (3). Eventually, this may promote the sharing of related meaning complexes (4).

Duck refers to such recognitions and acknowledgement of experience commonalities (usually in talk) as „relational force". Thus, the more experiences two persons share, the larger is their potential for a deep and meaningful relationship.[7] Empirical evidence for this notion was provided by Fraley and Aron (2004), who found

[7] According to Duck, even illusory similarities can have such effects because they „promote interest in continuing a relationship with another person in order to diversify and contextualize knowledge of that person" (1994, p. 112).

that experimental exposure to a shared humorous experience increased interpersonal closeness in encounters between 96 same-sex strangers.

#### 1.2.2.4 Metaphors

While Duck's model is highly intuitive and explains the powerful role of shared experiences in human communication, it does not address a fundamental problem in human interaction. That is, because *all* experience is idiosyncratic to some degree, how are humans ever able to understand nonshared and differentially coded experiences? Especially when confronted with an interaction partner that does not share personally significant thoughts and feelings, the creative use of language becomes necessary.

According to Roman Jakobson (1960), metaphors are a central vehicle in the communication of meaning because they can describe unfamiliar concepts with familiar ones (e.g., by comparing *love* to a *rollercoaster*). As Lakoff and Johnson (1980) argue, metaphors are derived from physical, social and cultural experience.[8] Because the elements of metaphors are typically unrelated in life, they require an „imaginative leap to recognize the resemblance to which a fresh metaphor alludes" (Chandler, 1994, chapter 8).

In the process of MU, the metaphor is especially important as a potential vehicle to communicate a *sense* in the absence of shared experiences. In an example from popular culture, Mark Renton, the hero in the film Trainspotting, describes the experience of taking heroin for somebody who has never used it: „Take the best orgasm you ever had, multiply it by a thousand and you're still nowhere near it." This quote exemplifies the utilization of shared experiences (sexual experiences) to communicate the sense of a non-shared experience (using drugs).

*Summary.*

To sum up Chapter 1, the current dissertation studies the process of mutual understanding of personally relevant thoughts and feelings in verbal communication

[8] Since all human individuals are familiar with body sensations, many metaphors refer to direct physical experience (e.g., the *head* of government). In 1744, Renaissance philosopher Giambattista Vico argued: „It is noteworthy that in all languages the greater part of the expressions relating to inanimate things are formed by metaphor from the human body and its parts and from the human senses and passions" (Vico, 1744/1968, cited in Chandler, 1994).

between dyadic partners. MU is related to empathy, social support, interpersonal rapport, and intimacy, yet it is also more specific and less dependent on the existence of close emotional ties. Instead, MU is conceived as an important first step in the establishment of supporting and intimate relationships. On the process level, MU requires individuals to encode thoughts and feelings into verbal utterances, which are then communicated to the interaction partner. The partner then decodes the message and (through an associative mechanism) produces a subsequent thought or feeling that can be communicated. Communication partners must often take each other's perspective to grasp the meaning of often idiosyncratic communions. This interpretation process is facilitated by reference to shared experiences. However, language may also enable communication of nonshared experiences through the use of metaphors, which require „imaginary leaps".

# 2 The Impact of Intelligence and Dispositional Valuations on Mutual Understanding

In the previous chapter, the linguistic and social mechanisms behind mutual understanding were discussed. In the current chapter, this background information is used to highlight the role of intelligence and dispositional valuations in the MU process. In Section 2.1, the intelligence and dispositional valuations, which are the independent variables of the current research, are described and relevant empirical evidence is reviewed. Section 2.2 covers main effects of intelligence and dispositional valuations, which are independent on the personality of the interaction partner. Section 2.3 reviews research regarding assortative patterns in relationship formation (i.e., the tendency for people to establish relationships with similar individuals). The existence of such patterns is interpreted as indirect evidence for dyadic effects of intelligence. Section 2.4 discusses dyadic effects, which are dependent on the interaction between the personalities of both interaction partners. Finally, the combined effects of main and dyadic influences and their implications for intellectually gifted individuals are covered in Section 2.5.

## 2.1 Review of Independent Variables

In studying the effect of intelligence and dispositional valuations on MU, the current dissertation focuses on three broad construct categories. Two out of three categories belong to the overarching category of intelligence. Although the exact definition of intelligence is still contested (Sternberg, 2000), most researchers would agree with David Wechsler's (1958, p. 7) global description that it is involved in "the global capacity of individuals to act purposefully, to think rationally, and to deal effectively with their environment." As stated above, intelligence is further divided into two subcategories. Following many intelligence researchers (e.g., Ackerman, 1996; Baltes, 1997; Cattell, 1963), a distinction is made between *fluid intelligence* and *crystallized intelligence*. Fluid intelligence as a context-independent resource needed to adapt to the environment, whereas crystallized intelligence represents the outcome of investment of fluid intelligence in specific domains, such as knowledge or expertise. The third broad category studied here is labeled *dispositional valuations*, which are defined as a set of constructs that involve the

differential value attached to actions and end goals. In the current framework, traits in this category include openness to experience, interests, and values. In the following, relevant research pertaining to intelligence and dispositional valuations is reviewed.

### 2.1.1 Fluid Intelligence

Belsky (1990, p. 125) defined fluid intellectual ability as „on-the-spot reasoning ability, a skill not basically dependant on our experience." Similarly, Cattell (1971, p. 99) defined it as "an expression of the level of complexity of relationships that an individual can perceive and act upon when he does not have recourse to answers to such complex issues already stored in memory". Both definitions stress the fact that fluid reasoning is involved in problems that are new to the person in question. Tests of fluid intelligence usually involve nonverbal materials that are not often encountered in everyday life. For example, the widely-used Raven's (1960) Progressive Matrices requires subjects to learn rule-based regularities in the design of unfinished abstract figures and to apply these rules to complement the picture (see Figure *4*).

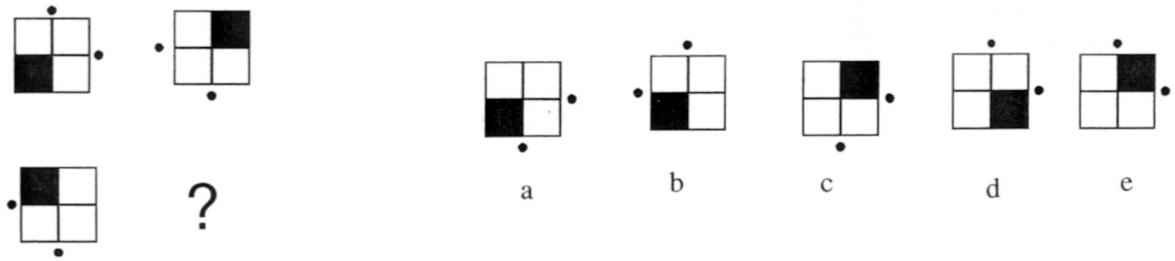



*Figure 4*. Sample Item of a Matrices Test of Fluid Intelligence

*Note*. Item 175 of the IST-2001 (Amthauer, Brocke, Liepmann, & Beauducel, 2001)

Fluid intelligence can be compared to Hebb's (1949) Intelligence A, which is hypothesized to be rooted in physiological processes. Consistent with this equivalence, various studies have demonstrated that age-dependent physiological declines are associated with a sharp drop in fluid intelligence, beginning in young adulthood (e.g., Baltes, Staudinger, & Lindenberger, 1999).

The relation between fluid intelligence and other intelligence factors is still unclear. For example, Gustafsson (1988) argues that fluid intelligence is identical to general

intelligence. Carroll's (1993) meta-analysis on the structure of intelligence, the most extensive contribution to this issue thus far, identified eight main intelligence factors that are related to a higher-order general factor. His results show that fluid intelligence is the factor closest to general intelligence but he did not argue that the constructs are identical (for similar findings, see Bickley, Keith, & Wolfle, 1995).

Unsatisfied with the supposedly „detached" nature of psychometric, fluid intelligence, a number of researchers have introduced the constructs of „emotional intelligence" and/or „social intelligence" to account for individual differences in relational skills. However, performance tests of social and emotional intelligence have often failed to demonstrate substantial independence from psychometric intelligence tests (for emotional intelligence, see Brody, 2004; Davies, Stankov, & Roberts, 1998; Roberts, Zeidner, & Matthews, 2001; for social intelligence, see Keating, 1978; Shanley, Walker, & Foley, 1971). Because of this, social and emotional skills are discussed here as particular instances of fluid intelligence applied in social contexts.[9]

The current study includes a sample of gifted individuals because, for reasons elaborated below, they are expected to be especially affected by intelligence differences between persons. Intellectual giftedness is defined here as an IQ of at least 130, so that the most intelligent 2% of the population can be described as intellectually gifted. Of course, the cutoff of 130 is somewhat arbitrary, yet it most closely reflects the consensus in the scientific community (Rost, 2000). Some alternative models conceptualize giftedness as multidimensional. For example, Renzulli (1986) defined giftedness as the simultaneous presence of not just an above-average IQ but also a high level of creativity and task commitment (for other multidimensional models of giftedness see Gagné, 1991; Heller, 2001). These models have been criticized for a lack of conceptual and empirical rigor (e.g., Rost, 2000). Since the present study is theoretically interested in the entire distributional range of intelligence, it is not necessary to dive into this discussion, since the assumption made in the current dissertation is that the mechanisms that are responsible for the effect of intelligence on MU are also at work at more moderate intelligence levels.

[9] Some researchers have proposed that tests of emotional/social skills are influenced by participants' knowledge structures (e.g., Zeidner, Matthews, & Roberts, 2001), which are a form of crystallized intelligence. Because research on this issue is mostly lacking, social and emotional skills are discussed together with fluid intelligence.

### 2.1.2 Crystallized Intelligence

In contrast to fluid intelligence, which is concerned with individual differences in reasoning ability in the face of novel stimuli, crystallized intelligence pertains to the *products* of the investment of fluid ability in specific environmental domains. These products are acquired over the life course instead of passively influenced by biological or environmental forces. Probably as a result, individual differences in crystallized intelligence are more resistant to age-related declines in neurophysiology (Baltes et al., 1999).

An important facet of crystallized intelligence is vocabulary, which refers to agreed-upon conventions regarding the meaning of words. Whereas some people only know a selected number of words, other people use highly differentiated terms and have detailed knowledge of synonyms, antonyms, and proverbs. Research has found that individual differences in vocabulary are an important source of differences in crystallized intelligence, yet tests of vocabulary also load high on the general factor of intelligence (Carroll, 1993; Ullstadius, Gustafsson, & Carlstedt, 2002). Consistent with the notion that crystallized intelligence may still increase while more fluid resources are already on the decline, a recent meta-analysis by Verhaeghen (2003) has demonstrated that vocabulary scores of older adults are higher than those of younger adults, with an average effect size of $d = 0.80$.

### 2.1.3 Dispositional Valuations

As stated previously, dispositional valuations involve the differential value attached to actions and end goals. In the current dissertation, the most important constructs in this category in terms of their impact on the MU process are openness to experience, interests, and values. As a dispositional valuation, openness to experience is conceptualized as influencing the value that people attach to structural features of cognition. Interests concern the differential valuation of certain activities. Finally, values involve the valuation of broad end goals. In the following subsections, a description as well as a brief summary of relevant evidence regarding these variables is provided.

#### 2.1.3.1 Openness to Experience

Openness to experience is the fifth factor of the „Big Five" model of personality description (John & Srivastava, 1999). It is usually treated as an intrapsychic dimension, describing individual differences in the structure and functioning of the mind. For example, McCrae and Costa (1997) link openness to differences in the „breadth, depth and permeability of consciousness and in the recurrent need to enlarge and examine experience" (p. 826).[10]

Open individuals seek out and reflect upon new experiences. This feature has some resemblance to *Need for Cognitive Closure* (NCC), which has been defined as the preference for a definite answer on some topic and an avoidance of confusion and ambiguity (Kruglanski, 1990). In fact, it is quite difficult to think of a highly open person that is intolerant of complexity and ambiguity, and vice versa. Consistent with this argument, a study by Webster and Kruglanski (1994) found significantly negative correlations between NCC and dogmatism and authoritarianism, which are aspects of low openness ($r$s ≈ .30).

#### 2.1.3.2 Interests and Values

Asendorpf (2003) conceptualized interests as tendencies to attribute pleasure and curiosity to some activities but not to others. Interests have been most extensively studied within the context of vocational aspirations. Numerous interest taxonomies have been proposed, such as Holland's (1959) hexagonal model, which proposes six basic interests. Realistic interests involve concrete objects and things; investigative interests involve intellectual pursuits; artistic interests are concerned with art and creativity; social interests concentrate on working with people; enterprising interests involve projects and commercial enterprise; and conventional interests are focused on clerical and computational tasks.

Rokeach (1973) defined a value as „an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence" (p. 5). In the current framework,

[10] McCrae and Costa (1997, p. 838) also speculated that open individuals have access to more thoughts, feelings, and impulses in awareness and are able to maintain more of these mental elements simultaneously in consciousness. These features of openness, however, correspond more to the categories of fluid intelligence (working memory) and crystallized intelligence (knowledge), respectively.

values can be conceptualized as the value attached to behavior (mode of conduct) and goals (end-state of existence). Because they can be important motivators for behaviors and have great emotional significance, values potentially affect MU.

## 2.2 Main Effects of Intelligence and Dispositional Valuations

Now that the most important categories of intelligence and dispositional valuations have been reviewed, the following section focuses on the main effects of these variables on the MU process. Such effects are at work when an individual's personality has a direct influence on the MU process, regardless of the personality of the interaction partner.

### 2.2.1 Fluid Intelligence

According to Chandler (1994), signs have both denotative and connotative meaning. Whereas *denotation* refers the literal and commonsense meaning of a sign (i.e., the meaning of a word in a dictionary), *connotation* refers to its socio-cultural and idiosyncratic associations. The ability to decode denotative meaning is more closely related to vocabulary (i.e., crystallized intelligence). In contrast, decoding personal connotative meaning requires the use of contextual cues. Because fluid intelligence is involved in the ability to integrate new information and make inferences, more intelligent people should be more adept in decoding the connotative meaning of an utterance.

As stated previously, fluid intelligence is closely related to social intelligence. Because of the relatively undeveloped state of research regarding emotional intelligence (Zeidner, Roberts, & Matthews, 2004), the following discussion mainly focuses on social intelligence. *Social intelligence* was defined by O'Sulivan, Guilford, and deMille (1965) as „ability to judge people" (p. 5) with respect to „feelings, motives, thoughts, intentions, attitudes, or other psychological dispositions which might affect an individual's social behavior" (p. 4). O'Sullivan et al. (1965) constructed tests for the measurement of social intelligence, starting from the assumption that „expressive behavior, more particularly facial expressions, vocal inflections, postures, and gestures, are the cues from which intentional states are inferred" (p. 6).

Expressive cues can be used to decode the connotation of verbal messages. Imagine a man and a woman who are driving in their car towards some destination. The woman is behind the steering wheel and has stopped at a red traffic light. After a while, the man

comments that „The light has turned green." When the man is very cynical in his tone, the sentence might be interpreted to mean something as „You are so stupid that I have to tell you what to do all of the time". Equally possible, the sentence might communicate a more collaborative attitude of wanting to help the partner in attending to the traffic. In this example, a person with high (social/emotional) intelligence would be able to correctly identify the underlying message.

Because of the generative nature of language, words have to be combined in novel, creative ways to communicate meaning. Intelligence is associated with a higher level of word fluency, so intelligent individuals can also be expected to be more skilled at encoding their own thoughts and feelings into linguistic utterances. Indeed, a study by Quay, Hough, Mathews, and Jarrett (1981) demonstrated that general cognitive ability is positively associated with communicative encoding. Furthermore, a meta-analysis by Davis and Kraus (1997) reported that cognitive ability is associated with superior empathic skills. The hypothesized superior ability of intelligent individuals to encode and decode verbal utterances gives rise to the first main effect hypothesis:

Main Effect Hypothesis 1: Fluid intelligence is positively related to MU. [Hm-1]

### 2.2.2 Crystallized Intelligence

The relation between vocabulary and the ability to encode and decode verbal material is close and obvious. To understand an utterance, it is necessary to understand the meaning of its constituting words. Consistent with this, a meta-analysis of 52 studies by Stahl and Fairbanks (1986) showed that teaching children the meaning of words improves their general reading comprehension, even of texts that do not contain the words that were taught ($d$ = .30). Although the relative contribution of fluid intelligence and vocabulary is still debated, some empirical evidence exists that vocabulary has a direct effect on language comprehension (Cain, Oakhill, & Lemmon, 2004).

When a person wants to express an idea or thought, the first step in this process is the selection of the word(s) that are most appropriate captures its meaning (Cleland & Pickering, 2003). Richer vocabularies are associated with a larger pool of words and concepts to express ideas (Lohman, 2000). Consistent with this, research on cognitive differentiation has found that the number of constructs a person uses to describe events is

positively associated with communication effectiveness (for a review see O'Keefe & Sypher, 1981). In addition, a study by Applegate, Kline, and Delia (1991) found that cognitively differentiated individuals communicate in a more person centered manner, which has been shown to promote interpersonal comfort (Jones & Guerrero, 2001). As a result, these factors should be related to increased levels of MU. This gives rise to the following hypothesis:

> Main Effect Hypothesis 2: Crystallized intelligence is positively related to MU. [Hm-2]

## 2.2.3 Dispositional Valuations

Because interests and values are not expected to exert a main effect on MU, the following section on main effects of dispositional valuations focuses only on openness to experience.

### 2.2.3.1 Openness to Experience

When people adjust communicative message to the background knowledge of their conversation partners, they have to be sensitive to the other person's perspective instead of assuming shared knowledge. Because people who are low in openness are thought to dislike unstructured, ambiguous situations, they may be less effective during the process of audience design than people high in openness (for a similar argument, see Gagne & Lydon, 2004, p. 333).

There is some evidence that this is indeed the case. Richter and Kruglanski (1999) let 99 college students provide descriptions of various abstract figures. Prior to the task, participants were told that either they themselves or a previously unknown participant were to use these descriptions in a referential communication task (see Section 1.2.2.1, for a description) scheduled several weeks later. Results showed that descriptions written by participants high in need for closure (i.e., low in openness) were shorter and contained more idiosyncratic references. Consistent with the idea that such messages contain a lower amount of socially shared information needed for effective communication, they were less likely to be successfully identified by others.

The following considerations give rise to the following hypothesis:

Main Effect Hypothesis 3: Openness to experience is positively related to MU. [Hm-3]

## 2.3 Between-Person Differences in Intelligence and Dispositional Valuations

A central organizing hypothesis of the current dissertation is that between-person differences in intelligence and dispositional valuations are negatively related to MU. When between-person differences are detrimental in social relationships, then people should be motivated to seek out peers with similar personality structures (because of the fundamental human drive for intimate, close relationships; Baumeister & Leary, 1995; McAdams, 1989; Reis, 1990). Accordingly, assortative patterns are an indirect argument for the detrimental influence of between-person differences in intelligence and dispositional valuations (the hypothesized mechanisms behind this association are discussed in Section 2.4). In the following section, evidence for niche picking with regards to general intelligence, crystallized intelligence, and dispositional valuations is reviewed. Subsequently, some interpretations for these findings are discussed.

### 2.3.1 General Intelligence

A number of empirical studies have focused on the similarity between marriage partners (assortative mating) in general intelligence. Table 2 summarizes the results of some representative studies. As can be seen, an average spousal correlation of .34 (after Fisher *r*-to-*z* transformation and back-transformation) is obtained across studies. This figure is almost identical to the weighted spousal correlation of .33 as reported by Bouchard and McGue (1981) in a review of 16 studies. Thus, it can be concluded that there is a moderate degree of spousal similarity in terms of general intelligence levels.

There is little research on assortative similarity in friends. Only some indirect evidence points in this direction. For example, it has often been documented that gifted children prefer older friends (Janos & Robinson, 1985). It could be speculated that this represents an effort to affiliate with persons of a comparable mental age. However, this interpretation needs to be backed up by more future research.

### 2.3.2 Crystallized Intelligence

Compared to the findings on assortative mating for general intelligence, less is known about spousal similarities in crystallized intelligence. Some of the studies reviewed in Table 2 report separate spousal correlations for verbal IQ (which is related to crystallized intelligence and vocabulary) or knowledge. For example, Tambs et al. (1993) found a correlation of .34 for the Information subtest of the WAIS, which measures general knowledge. Nagoshi et al. (1987) found a similarity correlation of .10 for verbal IQ, whereas Willoughby (1927, 1928; cited in Vandenberg, 1971) found a correlation of .44. When these coefficients are averaged, a similarity coefficient of .30 is found, which is very similar to the findings for general intelligence.

Because educational systems are designed to transfer knowledge, a person's educational level may be taken as a proxy for the sophistication of his or her knowledge structures. As can be seen in Table 2, the correlation between spouses' educational status is higher than found for fluid or crystallized intelligence. For example, Phillips et al. (1987) found an average spousal correlation of .41, Nagoshi et al. (1987) of .47, and Reynolds et al. (2000) of .54 (latent path correlation). Note, however, that these high correlations may partly be a result of similarities in fluid intelligence or a function of social stratification (see discussion below).

Table 2

*Spousal Correlations for General Intelligence, Crystallized Intelligence, and Education*

| Sample | *N* | G | Gc | Edu |
|---|---|---|---|---|
| Phillips et al. (1987) | 1,499 | .18 | | .41 |
| Tambs et al. (1993) | 232 | .32 | .34 | |
| Nagoshi et al. (1987) | 82 | -.03 | .10 | .47 |
| Mascie-Taylor & Vandenberg (1988) | 193 | .40 | | |
| Willoughby (1927, 1928) [ab] | 90 | .44 | .44 | |
| Jones (1928) [b] | 105 | .60 | | |
| Burks (1928) [b] | 274 | .47 | | |
| Reynolds et al. (2000) | 116 | .23 | | .54 |
| *Average* | | .34 | .30 | .48 |

Note. G = General intelligence, Gc = Crystallized intelligence, Edu = Education.

[a] nonverbal intelligence

[b] cited in Vandenberg (1971)

### 2.3.3 Dispositional Valuations

There exist indications for assortative mating in terms of dispositional valuations, especially for openness to experience. McCrae (1996, his Table 5) summarized spousal similarities for 14 openness-related traits and found an average cross-spouse (assortative) correlation of .41 (based on 19 coefficients; range .19-.74). Lykken and Tellegen (1993) reported that spousal personality correlations are mainly restricted to traits such as religiosity, conservatism, authoritarianism, and the endorsement of traditional values (*r*s .33 - .57; see also Feng & Baker, 1994), which are all facets of low openness.

Results from a number of studies suggest the degree of spousal similarity is higher for openness than for other personality traits. For example, McCrae (1996) reported spousal correlations for 103 couples and the strongest effect for openness ($r$ = .33), whereas the only other significant effect was found for conscientiousness ($r$ = .21). Botwin, Buss, and Shackelford (1997) found significant assortment effects for agreeableness and conscientiousness (*r*s = .22 to -.33), but more so for openness (*r*s = .38-.51). Finally, Waller (1999) studied personality similarity in 149 spouse pairs and found only one significant correlation for conventionality ($r$ = .41), which is related to (low) openness.

Between-person differences in dispositional valuations might affect the formation of friendships. Consistent with this notion, Cheng, Bond, and Chan (1995) asked 434 Chinese adolescents (aged 17-20) about their own and an „ideal friend's" personality and found a high similarity correlation ($r$ = .56) for openness to experience. Johnson (1989) sampled 56 pairs of close friends and 50 pairs of acquaintances from a residential, white, U.S. mid-western city (average age 37) and asked them what attracted them to the other person. An average of 76% of the close friends and 66% of the acquaintances named the similarity of values and interests, which made it the single most important self-rated predictor. These findings suggest that people prefer friends that are similar in their dispositional valuations.

## 2.3.4 Interpretation of Assortative Patterns Regarding Intelligence

### 2.3.4.1 Empirical Evidence

It is often assumed that assortative patterns regarding intelligence are the results of active phenotypic assortment. That is, people are hypothesized to actively seek out cognitive peers. In the current study, it is hypothesized that they do this because cognitive peers have less difficulty in communicating personally relevant thoughts and feelings. As a result, feelings of MU in particular and relationship satisfaction in general should be maximal when between-person intelligence differences are small.

To the best of the present author's knowledge, there exists only one empirical study that directly analyzed the relation between relationship quality and between-person intelligence differences. Lewak, Wakefield, and Briggs (1985) studied a sample of couples from the general population ($N$ = 81), half of which underwent marital therapy. Correlations between marital satisfaction and spousal IQ differences (assessed with the WAIS-R) were non-significant for simple difference scores ($r$s ranging between -.04 and .10) and small but negative for squared difference scores. Only in the case of verbal intelligence, a somewhat larger correlation of -.21 was found, but this association did not reach statistical significance.

Lewak et al. (1985) concluded from their findings that marital satisfaction is independent from similarity in intelligence. However, the validity of these conclusions is threatened by methodological flaws. Most importantly, the community and marital therapy sample differed markedly in the level and range of marital satisfaction ($d$ = .91, $p$ < .01), but not in the level of intelligence. Because it is not known whether the two samples also differed in their level of assortative mating on intelligence, marital satisfaction differences *between* samples may have canceled out differences between partners *within* the same sample. Thus, it is premature to take the Lewak et al. (1985) study as evidence against dyadic effects of fluid intelligence.

### 2.3.4.2 Alternative Explanations

As stated above, findings on spousal and friendship similarity suggest that people actively seek out cognitive peers as their friends or romantic partners. This might be the case because intelligence differences impair MU and thus conflict with the fundamental human need to establish close and intimate relationships. However, as is the case for all

conclusions based on correlational data, the causal factors behind this assortment are very difficult to study empirically.

One alternative explanation for assortative correlations such as the ones reviewed above is that modern societies are stratified according to intelligence levels. As a result, individuals will have more contact with peers of comparable intelligence (social homogamy). Therefore, assortative correlations regarding intelligence or any other education-related trait may be caused by passive availability instead of active selection (for empirical evidence, see Nagoshi et al., 1987; Reynolds et al., 2000; Tambs et al., 1993).

#### 2.3.4.3 Illusory Similarity

When personality similarity is assessed by taking only the perspective of a single individual into account, it may be influenced by a tendency to „project" one's own personality traits into the other person. In an exemplary study, Murray et al. (2002) asked 105 married/cohabiting couples and 86 dating couples about their own and their partner's personality. Illusory similarity was operationalized as the degree to which individuals rated their partners as more similar than they really were. Results showed that illusory similarity was positively related to relationship satisfaction in the married sample. In addition, illusory similarity in women predicted a higher stability of relationships in the dating sample. These results suggest that people in satisfying and stable relationships perceive similarities in their partners that are not evident in reality.[11]

Murray et al.'s (2002) findings have important implications for the current dissertation, as Study 1, 2, and 3 use the same informants to rate a) their own personality, b) the personality of their relationship partners, and c) the quality of the relationships with these partners. As a result, associations between perceived similarity and relationship quality are potentially confounded by an ego-centric tendency to project one's own personality on partners in satisfying relationships. This should be taken into account when interpreting the corresponding results.

[11] In spite of strong evidence for bias, empathic accuracy has been shown to increase with relationship length, at least under some circumstances (Neff & Karney, 2002; Thomas & Fletcher, 2003). Social judgment in close relationships is driven by both accuracy and bias, depending on the goals and motivation of the perceiver (Gagné & Lydon, 2004).

## 2.4 Dyadic Effects of Intelligence and Dispositional Valuations

In the previous section, the literature regarding between-person differences in intelligence and dispositional valuations was reviewed. It was concluded that there is a tendency for people to affiliate with cognitive peers. One of the main hypotheses of the current dissertation is that between-person differences in intelligence and dispositional valuations are detrimental to establishing a sense of MU in social relationships. However, the data on which this conclusion is based are indirect, and there are several possible alternative interpretations. In the current section, more direct evidence is presented.

### 2.4.1 Fluid Intelligence

In the following, dyadic effects of fluid intelligence are discussed. This discussion is divided in two subsections. First, intelligence plays a role in shaping differences in the kinds experiences people make in life, which may be related to MU. Second, differences in the generation of insight and ideas related to intelligence and their impact on the associative phase of the MU process are discussed.

#### 2.4.1.1 Shared Experiences and Evaluations

Because of its profound social consequences, intelligence can be an important determinant of the kind of experiences people make (Gordon, 1997). One of the principal reasons for this lies in the educational and vocational segregation according to intelligence. For example, university students are exposed to a very specific intellectual climate (consisting of reading books, discussing theories, etc.) that differs from that of their peers who directly enter the labor market after high school (Arnett, 2000). Accordingly, people with different intelligence levels are more likely to experience nonshared associations during a conversation, which may hamper MU.

#### 2.4.1.2 Insight and Ideas

As reviewed in Section 2.1.1., fluid intelligence manifests itself in reasoning about novel phenomena. Moreover, more intelligent individuals have been found to be more creative in solving divergent problems (Harris, 2004). Therefore, they may be more likely to produce insightful and creative associations during a conversation. For example, while discussing the long waiting lines in front of a museum, the idea might come up to send text

messages to potential visitors when the queue is shorter than usual (as was done during the Museum of Modern Art exhibition in Berlin, 2004).

The generation of new insightful and creative associations poses a challenge to the MU process, since such associations are not likely to be shared between interaction partners. First, the creative person is faced with the task of establishing a link between the interaction context and the creative or insightful idea. For example, the person in question might remark: „Looking at the long queue, I was wondering whether it would be possible to reduce the waiting time with some technical device."

Second, when the context of the new idea has been made transparent, the interaction partner needs to be convinced of its validity (e.g., would sending SMS text messages work?). In case of marked individual differences in intelligence levels, less intelligent people will not necessarily be able to understand the logic behind the novel ideas of very intelligent people. Especially when the person in question is very excited about the idea and wants to share it with other persons, MU will be hampered. This leads to the following prediction:

> Dyadic Effect Hypothesis 1: Between-person differences in fluid intelligence are negatively related to MU. [Hd-1]

### 2.4.2 Crystallized Intelligence

Interpersonal differences in vocabulary size should be related to dyadic effects in the MU process because persons with a very large vocabulary size are more likely to use words that are not shared by their interaction partners. When this is the case, subsequent decoding of the utterance by their interaction partners will be hampered, leading to interruptions in the MU process. Such „complicated" use of language is a potential hindrance to the sharing of meaning because it makes the discovery of shared experiences (Duck, 1994) more difficult. For this reason, between-person differences in vocabulary might even be consciously maximized to create interpersonal distance (e.g., when a person uses difficult „upper class" words).

The above considerations give rise to the following hypothesis:

Dyadic Effect Hypothesis 2: Between-person differences in crystallized intelligence are negatively related to MU. [Hd-2]

### 2.4.3 Dispositional Valuations

According to Duck's (1994) theory, individuals with more shared experiences have a larger potential to develop a deep and meaningful relationship. A crucial prerequisite in his four-phase model is that both individuals agree in the evaluation of these experiences (see Figure *3*). Also, recall that a crucial step in the formation of intimacy is that individuals feel valued by their interaction partners. Because dispositional valuations are directly involved in evaluations of other persons (e.g., Heaven & Oxman, 1999), they are hypothesized to be an important source of dyadic effects on the MU process. In the following, the effect of openness to experience, interests, and values is discussed.

#### 2.2.3.1 Openness to Experience

As described above, openness to experience is closely related to interpersonal differences in tolerance for ambiguity. According to McCrae (1996), between-person differences in the thinking style of open vs. closed individuals can be a serious interaction problem and lead to mutual avoidance. For example, a study by Kirton (1976) classified managers as either „innovators" (high openness) or „adaptors" (low openness). It was found that adaptors regarded innovators as neurotic and insensitive to others, whereas innovators saw adaptors as dogmatic, inflexible, and conservative (for related evidence, see de Dreu, Koole, & Oldersma, 1999). Consistent with this, a large-scale survey by Gurtman (1995) showed that individuals low on openness complain more about being too easily swayed by others[12], which might be the underlying reason for their „defensive" and rigid thinking style. Indeed, according to McCrae (1996, p. 331):

> Open people are bored by the predictable and intellectually undemanding amusements of closed people; closed people are bored by what they perceive to be the difficult and pretentious culture of the open.

[12] Of course, the fact that close-minded people are more easily persuaded by the opinions of other people makes the label „openness" somewhat problematic.

This gives rise to the following hypothesis:

Dyadic Effect Hypothesis 3: Between-person differences in openness to experience are negatively related to MU. [Hd-3]

2.2.3.2 Interests and Values

Differing valuations of activities and goals are another potential source of nonshared evaluations of experience. For example, in countries with a military draft, all healthy men of a certain age are called to arms for a period of one to three years. Although they share a mutual experience, they might disagree on the meaning of this experience. For example, some persons enjoy military service as a time of male bonding and serving their country, whereas other individuals develop an aversion to the strict discipline and unquestioning patriotism (Goldstein, 1943).

Research in the so-called attraction paradigm (Byrne, 1971) has established that individuals are attracted to others with similar attitudes. Most studies carried out in this paradigm have relied on the so-called bogus stranger method. In this method, individuals are given a description of an imaginary person, who is displayed as either similar or dissimilar to the self. Results from a large number of studies using this paradigm are consistent with the notion that people are attracted to others with similar attitudes (Byrne, 1997).

The findings carried out within the attraction paradigm are easily reconciled with Duck's (1994) notion that MU is dependent on the exchange of similarly evaluated experiences. There have been concerns, however, that the bogus stranger methodology may not be ecologically valid. Indeed, in the absence of any other information about a person, it makes sense for individuals to base their evaluations entirely on attitude similarity. Employing more naturalistic designs, however, Sunnafrank (1983; 1984; 1992) demonstrated that the influence of perceived similarity on attraction fades away when subjects are allow to interact with each other. Because these results are only based on a few experiments and some research has provided contradicting evidence (Cappella & Palmer, 1990), the more conservative prediction is that similarity in interests and values is positively related to MU:

Dyadic Effect Hypothesis 4: Between-person differences in interests and values are negatively related to MU. [Hd-4]

## 2.5 Combining Main and Dyadic Effects

In the following section, some implications of the combined influence of main and dyadic effects are discussed. As will be seen, most research in this domain has focused on the social effects of (fluid) intelligence. The following section focuses on two domains. First, Simonton's (1985) model of the impact of intelligence on group influence is discussed. After this, research on the social adjustment of intellectually gifted individuals is reviewed, much of which assumes a dyadic effect of intelligence on social relationships (though the theory behind this assumption often remains implicit). This section finishes with an hypothesis regarding the combined impact of main and dyadic effects in cognitively gifted individuals.

### 2.5.1 Simonton's (1985) Model of Intelligence and Group Influence

#### 2.5.1.1 Description of the Model

As stated above, intelligence is hypothesized to exert a positively main effect on MU, yet at the same time, large dyadic differences in intelligence may be detrimental to effective communication. Simonton (1985) used a similar logic to predict the optimal intelligence level for influence in groups. On the one hand, more intelligent subjects are assumed to generate higher quality contributions (consistent with Main Effect Hypothesis 1). This can be an important advantage because the contribution of each group member must „survive" the criticism of more intelligent members in order to become accepted. When only this Criticism factor would be at work, the most intelligent group member should eventually win over the group and become its leader.

This prediction might sound plausible at first, but it does not coincide with everyday experience, where it is often the case that political and economic leaders are not the most intelligent members of the population. For example, it is contended that John F. Kennedy had an IQ of 119, which would place him „only" one *SD* above the mean.

To explain this observation, Simonton hypothesized that highly intelligent individuals' ideas are too complicated to be communicated to most other people (Comprehension factor). Because less intelligent individuals are not able to comprehend

more intelligent persons' remarks, they are not likely to be influenced. Formalized in mathematical terms, Simonton assumed that an intelligence difference of more than one *SD* is enough to hamper interpersonal communication. When only the Comprehension factor is at work, people with an intelligence level of 108 should have the largest potential to influence others.

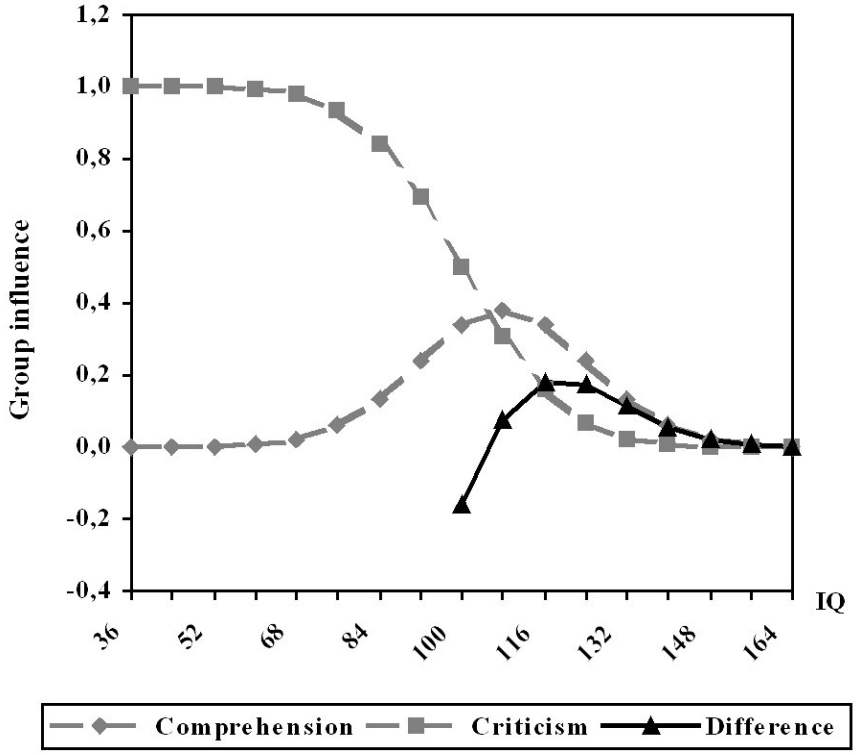



*Figure 5*. Model of the Relation Between Intelligence and Group Influence According to Simonton (1985).

*Note*. According to Simonton (1985), the effect of intelligence on group influence is dependent on the additive effect of two factors. First, more intelligent people face less criticism from other group members (depicted by the asymptotically decreasing curve). Second, however, interpersonal comprehension is highest at more moderate levels of intelligence (depicted by the bell-shaped curve). When the Comprehension and Criticism factors are combined (via subtraction), a function of the predicted association between intelligence and group influence is obtained that peaks around an optimal IQ level of 119.

As stated above, extremely intelligent people are more likely to produce effective solutions to problems. Because most members of normal social groups have more limited cognitive abilities, however, these ideas may be too complicated to be able to influence

others. When the Comprehension and Criticism factors are combined (by means of subtraction), a curvilinear (inverted U) relation between IQ and interpersonal influence is obtained that peaks around an IQ of 119[13] (see Figure *5*). This new optimum lies in between the extremely high IQ level predicted by the Criticism factor and the moderate IQ level predicted by the Comprehension factor.

Although this prediction of a curvilinear, inverted-U relation between intelligence and group influence is relatively clear-cut, the model and the exact form of the intelligence x group influence function depend on a number of assumptions:

- Intelligent group members are expected to resist adjusting their level of complexity towards the mean group level. According to Simonton, it is likely that they do so because artificially lowering the complexity of one's speech would sound insincere. Moreover, intellectual peers and superiors exert pressures to display one's maximum level of intellectual sophistication.
- If the group is formed to solve a certain problem, then the Criticism factor may be more important than the Comprehension factor. Under these circumstances, the group will focus on its most intelligent members („experts") in order to arrive at the best solution. In contrast, in an emotion-focused group, the Comprehension factor should become more important.
- The optimal intelligence level for group influence is dependent on the average intelligence of its members. In groups of highly intelligent people, the model still predicts an inverted U, but the optimum intelligence level shifts towards higher levels.

#### 2.5.1.2 Empirical evidence

In spite of the plausibility of its theoretical predictions, Simonton's model is not yet well-established and direct empirical evidence is mostly lacking. Only some indirect evidence is consistent with its predictions. Specifically, there are scattered findings that group leaders are indeed moderately above-average in intelligence (i.e., about 1.2 *SD*s above the population mean). For example, Gibb (1947) found that military officer candidates were 1.2 to 1.5 *SD*s more intelligent than the group they were to lead. In addition, Ghiselli (1963) tested the success rate of middle managers and found that optimal levels were achieved by those scoring between 1.2 and 1.5 *SD*s above the mean. Because direct support for the model is mostly lacking, the current study tries to test the Simonton model in the context of close interpersonal relationships.

[13] This corresponds to a deviation of 1.2 *SD*s above the mean; note that this is exactly the score Kennedy is supposed to have reached.

### 2.5.2 Application of the Simonton (1985) Model to the Adjustment and Social Relationships of Gifted Individuals

The hypothesized negative dyadic effect of intelligence discrepancies on MU has clear implications for gifted individuals. Because the percentage of individuals at both extreme ends of the normal distribution is very small, the Simonton model predicts that gifted individuals, who are more than two *SD*s above the mean, can only communicate with about 16% of the population (i.e., applying the 1 *SD* criterion). By comparison, a perfectly average individual with an IQ of 100 could communicate with about 68% of the population. For extremely gifted individuals, the Simonton (1985) hypothesis predicts even greater problems. For example, the pool of communication partners of a person with an IQ of 145 is predicted to be restricted to only 2% of the population. As a result, these individuals may have more difficulty in finding friends or romantic partners with whom they can communicate at a satisfactory intellectual level. This should be associated with reduced feelings of being understood.

There exist few well-designed studies on the adjustment of gifted individuals. This is true despite an increased interest in the topic of giftedness in recent years (Rost, 2000, p. 7). Many studies use self-selected or clinical samples (e.g., participants of a summer camp for the gifted or psychiatric patients), which are not representative of the broader population. As a result, only findings from a small number of selected studies are reviewed here. As will be seen, empirical findings are mixed, with some studies showing superior adjustment, whereas others suggest adjustment problems, depending on the type of outcome and the level of giftedness that is considered.

#### 2.5.2.1 Studies Showing Superior Adjustment of Gifted Individuals

Terman (1925; Terman & Oden, 1959) compared teachers ratings of 532 gifted subjects (aged 7-14 years; mean IQ = 151) and 533 classmates (aged 10-14 years; mean IQ unknown) with regard to a number of social characteristics. This classic study has provided a wealth of information regarding the social adjustment of gifted children. In contrast to the stereotype of the sickly, socially awkward gifted child, his results demonstrated that 70% of these children were judged to outperform their peers in terms of leadership, whereas ratings of popularity ratings were slightly above-average (56%).

Terman's results suggest an above-average adjustment of gifted children. Note, however, that his gifted sample was identified through teacher nominations. Because teachers (often implicitly) associate giftedness with well-adjusted behavior, it cannot be ruled out that the higher reported adjustment level of gifted children was partly caused by a so-called *halo* effect: the tendency of positive evaluations in one domain to affect more generalized impressions of a person. That is, it is possible that the Terman teachers were particularly fond of well-behaving and adjusted pupils and generalized these impressions to the cognitive abilities of these children (Rost, 2000). Accordingly, such children may have been more likely to be included in Terman's gifted sample.

Janos and Robinson (1985) reviewed several studies on giftedness and adjustment and found that in the majority of studies, moderate levels of giftedness were related to better adjustment. Their conclusion corroborates Terman's results that gifted individuals have better social reasoning and perspective taking skills. It is also consistent with a meta-analysis of 20 studies by Hoge and Renzulli (1993), who found that gifted children have higher levels of general self-esteem (average effect size $d$ = .20; see Roznowski, Reith, & Hong, 2000, for similar findings).

#### 2.5.2.2 Studies Showing Some Adjustment Problems of Gifted Individuals

The studies reviewed above point to superior adjustment for gifted individuals. In the following, evidence for adjustment problems is discussed.

In Germany, Rost (2000) followed 107 gifted children and adolescents (mean age 15 years) drawn from a community sample (mean IQ = 136) and 118 highly achieving age mates (mean IQ = 102) and compared them to a control group of comparable size. Although both gifted and the highly achieving individuals had higher levels of academic self-esteem and their classroom behavior was rated more positively by their teachers, they had more negative self-perceptions of peer popularity. The highly achieving group also had a somewhat more negative self-concept of relationships with peers of the other sex, whereas the male subjects of this sample also perceived same-sex relationships as more problematic. Finally, both gifted and highly achieving individuals reported a lower frequency of meeting friends than controls.

Hollingworth's (1942) classic study followed a sample of 12 extremely gifted children (IQ = 180, initial age = 12) from New York until they were in their early twenties. According to Hollingworth, these children experienced great difficulties in relating

satisfyingly to their normal intelligence peers. In her words, they were „too intelligent to be understood by the general run of persons with whom they make contact", leading to a state of „loneliness and personal isolation from their contemporaries" (p. 264). She saw the reason for this lack of understanding in the fact that „other children [did] not share their interests [and] their vocabulary" (p. 262).[14]

From her observations, Hollingworth concluded that extreme levels of giftedness are related to serious communication problems. Note, however, that her results are limited by several methodological weaknesses. First, her extremely small sample makes it difficult to generalize to broader populations. Second, it can be questioned whether her subjects really had an IQ above 180, since most intelligence tests do not reliably differentiate at such a high level. Third, Hollingworth herself contented that „as persons become adult, they naturally seek and find on their own initiative groups who are like-minded, such as learned societies" (p. 264). Thus, it could be that the adjustment difficulties she found in children can be compensated for in older age (but see Janos and Robinson, 1985, who speculated that adjustment problems might increase with age).

An analysis of the extremely gifted individuals from the Terman sample is consistent with the notion that extreme levels of giftedness are associated with problems. When his sample was 41 years old, 71% of the men ($n$ = 551) and 67% of the women ($n$ = 453) were rated as well-adjusted. The mean IQ score in this well-adjusted group was 136 and 131 for the men and women, respectively (Terman and Oden, 1959). In contrast, the combined groups of subjects with „some maladjustment" and „serious maladjustment" had an average IQ of 149 and 139. The differences between these two adjustment groups correspond to effect sizes of .42 and .28 for men and women, respectively (pooled $SD$s = 26 and 28).

[14] The social difficulties of Hollingworth's gifted children may be reminiscent of the Asperger syndrome, which is characterized by impairments in social interaction and repetitive patterns of behavior in absence of any delays in cognitive development. However, individuals with Asperger have been shown to have substantial language problems (Koning & Magill-Evans, 2001), whereas Hollingworth's subjects had superior language skills.

#### 2.5.2.3 Conclusion

The review of the literature on the social adjustment of gifted individuals gives rise to some mixed conclusions. On the one hand, the classic Terman study and the literature reviews by Janos and Robinson (1985) and Hoge and Renzulli (1993) suggest superior generalized adjustment for gifted individuals. Somewhat in contrast, the findings of Rost (2000), Hollingworth (1942), and the re-analysis of the Terman sample suggest that gifted children could face some difficulties in their social relationships, especially at extremely high IQ levels.[15]

The notion that only extreme levels of giftedness might be associated with problems in social relationships is consistent with the predictions of the Simonton model. As stated before, individuals with extremely high intelligence levels should indeed face the greatest trouble in communicating their thoughts and feelings, and these difficulties should translate into adjustment problems in the social domain. Even in modern-day educational and vocational systems that are stratified according to intelligence, extremely gifted individuals might face problems in finding cognitive peers.

Further support for the notion that extreme levels of giftedness cancel out the positive social effects of intelligence comes from a large-scale study by Schneider, Clegg, Byrne, Ledingham, and Crombie (1989). These authors tested 150 gifted children (Grades 5, 8 and 10, mean IQ $\geq$ 129) who were educated in special classes, 204 integrated gifted individuals (not enrolled in special gifted classes), and 193 controls (mean IQ $\approx$ 112). They found the correlations between IQ and social competence (measured by self-nominations) were mostly positive in the control group ($r$ = .52 in Grade 5, $r$ = .20 in Grade 8), non-significant in the self-contained (special education) gifted sample, and negative in the integrated gifted sample ($r$ = -.22 in Grade 5, $r$ = -.23 in Grade 8). In addition, the intelligence difference between integrated gifted individuals and the average of the control children in the same class was negatively related to its peer acceptance in Grade 5 ($r$ = -.33).

---

[15] Social difficulties may co-exist with average or even superior levels of „generalized" adjustment. First, it is possible that some gifted individuals compensate problems in the social domain with the self-esteem gained by superior academic achievements. Second, the reviews of Janos and Robinson (1985) and Hoge and Renzulli (1993) are based on generalized adjustment measures that might be only weakly related to adjustment in specific social settings.

The above considerations give rise to the following hypothesis:

Extreme Group hypothesis: Intellectually gifted individuals experience a lower level of MU in their social relationships.

## 2.6 Summary of Main and Dyadic Hypotheses

To summarize, the current study addresses a number of hypotheses about main and emergent effects of intelligence and dispositional valuations. Factors that exert a main effect influence the MU process independent of the personality of the relationship partner. The following three main effect hypotheses are addressed:

Main Effect Hypothesis 1: Fluid intelligence is positively related to MU.

Main Effect Hypothesis 2: Crystallized intelligence is positively related to MU.

Main Effect Hypothesis 3: Openness to experience is positively related to MU.

Besides focusing on main effects, the current study also focuses on dyadic effects that result from the dynamic interaction of both communication partners. A total of four dyadic hypotheses are addressed:

Dyadic Effect Hypothesis 1: Between-person differences in fluid intelligence are negatively related to MU.

Dyadic Effect Hypothesis 2: Between-person differences in crystallized intelligence are negatively related to MU.

Dyadic Effect Hypothesis 3: Between-person differences in openness to experience are negatively related to MU.

Dyadic Effect Hypothesis 4: Between-person differences in interests and values are negatively related to MU.

Combining main and dyadic effects, the following hypothesis regarding the quality of social relationships of gifted individuals is tested:

Extreme Group Hypothesis: Intellectually gifted individuals experience a lower level of MU in their social relationships.

# 3 Chapter 3: Method

Chapters 1 and 2 presented empirical findings and conceptual arguments that provided a theoretical background regarding the MU process and how it is influenced by intelligence and dispositional valuations. These theoretical chapters culminated in a number of hypotheses. In the following chapter, the characteristics of the samples (3.1), procedures (3.2), and measures (3.3) that were used to test these hypotheses are discussed.

## 3.1 Sample Characteristics

### 3.1.1 Rationale for Sample Selection

To address the study's research questions, data from four samples of participants were collected. The first group consisted of intellectually gifted individuals who are members of Mensa, an organization for the gifted. The second sample consisted of high achieving and average achieving alumni from two major Berlin universities. The third group consisted of Internet users. Finally, the fourth group consisted of university students who took part in a lab experiment. The choice of samples and the accompanying study designs was guided by a number of considerations that are described briefly below.

Samples 1.I and 2 were included to address the main and dyadic effect hypotheses using self-ratings of intelligence and ego-centered social networks in samples that differ in their cognitive level and the importance they attach to this domain. Mensa members have been tested with an intelligence test, so they are aware of their giftedness status and apparently attach a high importance to this fact. In contrast, the highly achieving alumni sample may also be regarded as gifted in terms of their academic achievements, but these individuals do not necessarily regard themselves as such. Finally, the averagely achieving alumni can be hypothesized to be more diverse in terms of their intelligence and the importance attached to this trait.

To avoid sole reliance on self-reports, Samples 1.II and 3 were added. In Sample 1.II, Mensa members' reports were complemented with data from some of their network partners in order to identify possible bias in social judgment. This allowed a more stringent test of main and dyadic effects. Participants in Sample 3 took a psychometric vocabulary tests to investigate the main effects of crystallized intelligence on social network characteristics without relying on self-ratings.

The data collected in Sample 4 served to study the impact of intelligence and dispositional valuations on MU in the context of interactions between strangers in a more controlled, experimental setting. This allows an examination of the effects of personality differences on social relationships that are not self-selected. Moreover, the intelligence and dispositional valuations of each member of the dyad were measured independently with psychometric instruments as well as rated by both persons, which allowed for the disentanglement of the effects of „true" vs. „ego-centric" similarity on MU. Finally, the effect of similarity expectations was tested by an experimental manipulation that informed subjects that they were either very similar or very dissimilar to each other (compared to a control group receiving no information). In the following, descriptive information regarding the composition of each of the samples is provided.

### 3.1.2 Sample 1

With over 100,000 members worldwide, Mensa is the largest international organization for gifted individuals. As the sole criterion, members need to surpass the 98th percentile of the intelligence distribution (i.e., have an IQ higher than 130), of which proof in the form of an official intelligence test is required upon admission. In Germany, Mensa has about 4,500 members (*Mind-Magazin*, Nr. 39). Against a statistically possible member pool of well over 1 million Germans (using the 98th percentile criterion), powerful self-selection mechanisms can be expected.

Participants were recruited in two ways. First, a popular scientific article on the subject matter of the current study was written for the magazine „Mind", the bimonthly periodical for Mensa Germany. Although every member receives the magazine, it is not known how many actually read it. Included in the article was a call for participation in the current study. Participants could either order a P&P version of the questionnaire or fill out an online version. To ensure the giftedness status of the participants, they were required to provide their Mensa membership number upon participation. This recruitment method resulted in a total of 273 Mensa members who completed either the paper & pencil (P&P) or the Internet version of the questionnaire. Eleven of these cases were excluded because they were either younger than 18 or older than 120. In addition, 24 persons were excluded who did not provide personality information AND at least four network persons, five persons because they did not provide any social network information, and one person

whose questionnaire responses lacked meaningful variance. This procedure resulted in a total of 232 cases with usable data. These participants will be referred to as Sample 1.I.

Second, a call for participation were sent to the electronic mailing lists of the Mensa branches in Berlin, Hamburg, and to the division of Mensa members aged around thirty (U3SIG). This fully electronic procedure resulted in a total of 472 individuals accessing the emailed URL link. Of these, 39 individuals stated they were younger than 18 or older than 120, 332 individuals failed to provide personality information AND at least four network persons, and two individuals did not show any variation in the ratings of their network partners' intelligence. Accordingly, a total of 99 useable participants were collected (45 females, average age 30.9). Because the study procedure for these participants was different (in terms of the questionnaire that was used and the availability of dyadic information), they will be referred to as Sample 1.II.

Table 3 summarizes the characteristics of the total sample MENSA sample. Of 331 cases, 270 (82%) had used the Internet and 61 the P&P version of the questionnaire. The mean age in this group was 34.0 (*SD* 9.0), which corresponds closely to the mean age of all Mensa members (*Mind-Magazin*, Nr. 39). With 51% of the participants being female, the sample was fairly gender-balanced. However, because the MENSA member pool has more men than women (2:1; Alain May, personal communication, 2004), this implies a selection bias favoring women participation. The 273 Mensa members of Sample 1.I (who reacted to the call for participation in the Mensa magazine) provided data regarding their level of education. Of these, 14.5% reported the German gymnasium (college) as their highest education level, for 23.2% an apprenticeship (*Ausbildung*), 47.7% some form of university degree, and 8.7% a PhD. This represents quite a broad range of educational status for an intellectually gifted sample.

Table 3

*Description of Demographic Information and Study Procedure Across Samples*

| | Sample 1: MENSA members | Sample 2: University alumni | | Sample 3: Internet users | Sample 4: University students / alumni |
|---|---|---|---|---|---|
| | | HA | AA | | |
| Assessment period | 02/03-02/04 | 03/03-02/04 | | 03/04-12/04 | 02/04-06/04 |
| *n* | 331 | 152 | 70 | 528 | 144 |
| Age | 34.0 (9.0) | 27.1 | 27.8 | 27.9 | 24.1 |
| *(SD)* | | (2.3) | (3.4) | (8.3) | (3.9) |
| % female | 51% | 56% | 65% | 78% | 51% |
| Dyadic data | Yes [a] | No | No | No | Yes |
| Intelligence | SR + TEST [b] | SR | SR | TEST | SR + TEST |

*Note*. HA = High achievers, AA = Average achievers, SR = Self-ratings, TEST = Psychometric test

[a] 174 partner-reports for a subsample of $n = 40$.

[b] Self-reported IQ test results for a subsample of $n = 76$.

## 3.1.3 Sample 2

### 3.1.3.1 High Achieving (HA) Alumni

With the permission of the university's privacy commissioner („Datenschutz-beauftragter"), the examinations office of the Humboldt University Berlin was asked to provide the addresses of the university graduates whose final grade belonged to the top 14% of their peers within the same faculty. This criterion includes all participants who were at least one *SD* higher in achievement than their peers; although arbitrary, this cutoff secured an adequate samples size without being overinclusive.

Data collection was carried out in three waves between March 2003 and June 2003, when 322 former students of the Humboldt University Berlin and the Free University Berlin who had received their degrees during the past year were contacted. Because many

alumni move to another city upon their graduation, it was expected that not all questionnaires would reach their target. In the first[16] wave, 13% of all questionnaires could not be delivered to the address and were returned to sender. Because some additional questionnaires may have successfully arrived at the specified address but the targeted person no longer lived there, the percentage of unsuccessfully contacted alumni was estimated at 15%. Because of the anonymous nature of the participant recruitment, it was not possible to send reminder letters, which might have raised the response rate.

Between March 2003 and February 2004, the estimated 274 successfully delivered participation letters (85% of 322) sent to the high achieving graduates resulted in 174 filled-out P&P or Internet questionnaires. By applying the same exclusion criteria as in Sample 1, 20 respondents were excluded, resulting in a total number of 154 participants. This corresponds to an enrollment rate of 56%, which is quite high given the absence of financial reward and the fact that the questionnaire took about 60 minutes to fill out. Moreover, the gender composition of the sample was quite balanced, with 56% females. The mean age was 27.1 years (*SD* 2.3).

#### 3.1.3.2 Average Achieving (AA) Alumni

Parallel to contacting the top 16% achievers, university graduates who fell between the 42nd and 58th percentile in terms of academic achievement (average 16%) were contacted. Across all three waves, 317 former students were contacted. Against an estimated 269 effectively delivered questionnaires, a total of 89 people responded by contributing at least some data. Applying the criteria described above resulted in 18 excluded cases, bringing the total number of participants in this group to 70. The low response rate of 26% suggests that selection biases were strong in this sample. This was reflected in the more biased gender ratio (65% women), though the average age (27.8, *SD* 3.4) was very similar to that of the highly achieving group.

Some differences between the highly achieving and the average achieving alumni's may be due to differences in the invitation letter they received. In the highly achieving pool, subjects were praised for their high achievement and told that their responses were particularly interesting to study the relation between giftedness and social relationships. In

[16] For logistical reasons, the number of questionnaires mailed to invalid addresses could not be calculated for the other waves.

contrast, the average achieving subjects were told that the study was directed at gifted individuals but that academic achievement is not only determined by intellectual ability, so people with varying achievement levels were contacted. In hindsight, targeted individuals may have suspected that they had been assigned to the control group of less achieving subjects, which could have discouraged participation.

### 3.1.4 Sample 3

Because of the biased nature of Samples 1 and 2, an additional sample of Internet users was recruited. For this purpose, a description of the study together with a call for participation was published in a number of German-language sites dedicated to online psychological research, including the PSYTESTS portal of the Humboldt University Berlin (http://www.psytests.de). As an incentive for participation, feedback regarding the Big Five and the level of verbal intelligence was offered after completion of the questionnaire.

A total number of 845 individuals aged 18 or older accessed the questionnaire site. As is usual in online research, some of these individuals only „glanced through" without providing any information. In the present case, a total of 301 individuals failed to fill out either the Big Five or verbal intelligence test (80 subjects in this subgroup also failed to provide information on at least four social relationships and 1 subject failed to provide gender information). Moreover, 16 individuals did not show any variability in the rated intelligence of their network partners. Thus, the final sample comprised 528 participants. Of these individuals, 78% were female and the average age of the sample was 27.9 (*SD* 8.3).

### 3.1.5 Sample 4

The fourth sample consisted of university students or alumni who reacted to an article in the Humboldt University newspaper about the impact of personality on interpersonal communication or to flyers that were widely distributed in places frequented by Berlin students (university buildings, university restaurants, university bus stops, etc.) As an incentive to participate, a sum of 15 Euro (around $20) and a personal feedback profile were offered. The topic of the study was described as „interpersonal communication".

Participants were required to apply for participation via an online questionnaire. A total of 433 people visited the corresponding website that also included a more detailed description of the study. Of these potentially interested individuals, a total of 200 proceeded with filling out the pre-test questionnaire and left an email address or phone number where they could be contacted. To ensure a balanced sex ratio, the questionnaire for each gender was closed after 100 male/female participants took part (this took longer for the male participants).

During the course of the study, 144 participants actually visited the laboratory and completed the full experiment. Of the remaining 56 individuals, 6 could not be contacted, 34 cancelled their participation or did not show up for the scheduled meeting, 8 came to the lab but could not be videotaped because their scheduled partner did not show up, and 8 were excluded because they were not German native speakers (this was a declared requirement for participation to avoid confounding of language skills and communication quality).

The remaining individuals of the fourth sample consisted of 74 females and 70 males and the mean age was 24.1 (*SD* 3.9). The participants had diverse backgrounds in terms of their university major, with 30 (21%) students/graduates from a language or philosophy department (mostly German language, foreign language, and philosophy students), 38 (26%) from the social sciences (including 15 psychologists[17]), 13 (9%) from law or economics, 44 from the natural sciences (31%) and the remaining 13% from other disciplines (medicine, agriculture, engineering, and art).

## 3.2 Procedure

### 3.2.1 Studies 1.I, 2, and 3

Participants in Samples 1, 2, and 3 filled out the measures used in the present study at home without being monitored. To answer participants' questions regarding the study's procedure, a special email address and telephone hotline was created, but this option was

[17] Because psychologists were thought more likely to have some background knowledge regarding the constructs that were studied, it was chosen to avoid reliance on their participation as much as possible. Therefore, no flyers were distributed in places that are primarily visited by psychology students.

only rarely used. Apparently, participants had no trouble completing the current questionnaire. The order of the presentation of the scales was fixed, starting with the social relationships questionnaire, followed by the intelligence, self-concept, and Big Five self-ratings. The only exception to this fixed order was Sample 3, where the psychometric vocabulary test replaced the self-concept scales.

### 3.2.2 Study 1.II

The 99 individuals from Sample 1 filled out a modified version of the social network instrument described in Section 3.3.1. After compiling a list of their network partners, participants had the option to invite each partner to take part in the current study. This option was chosen by 71 participants for at least one network partner. In total, 607 relationship partners were contacted by the Psychological Institute via regular mail or email, or directly received a printed questionnaire from the participants themselves.

The questionnaire for the contact persons was available in both an online and P&P version and required the contact persons to fill out the NEO-FFI questionnaire, rate the person that had invited them to participate in the study (i.e., the Mensa member) in terms of intelligence, and assess the quality of the relationship with that person ($\alpha = .75$). A total number of 174 contact persons (94 females; response rate 29%) of 40 Mensa members contributed data, of which 51 used the P&P[18] and 123 the Internet version. The mean age of these individuals was 32.9 years ($SD = 12.4$).

### 3.2.3 Study 4

At the end of the pretest questionnaire in Study 4, participants were invited to visit the Psychological Institute in Berlin Adlershof where they would discuss up to three personally important life domains[19] with another person. They were told that this conversation would be videotaped.

---

[18] Contact persons returned the questionnaires directly to the Psychological Institute, without further mediation by the primary participants.

[19] Participants were instructed that these life domains did not need to be identical with the list of values of the Rokeach Value Survey.

#### 3.2.3.1 Creation of Dyads

To create dyads with a maximum variance in psychometric intelligence levels, an experimental manipulation was performed. For this purpose, a composite intelligence score was calculated from the results of the available pretest information. As can be seen in Table 4, the vocabulary test was characterized by a marked range restriction (i.e., the *SD* was much smaller than the typical 15 points), which prohibited the usual procedure to *z*-standardize results. Instead, both the numerical and the vocabulary results were scored according to available norm data. For the numerical test, comparison data from a sample of 279 Gymnasium students were used, whereas the vocabulary test was normed according to data from 159 representative adults from the German ALLEE study (aging and life experience; Lang, Lüdtke, & Asendorpf, 2001).

As can be seen in Table 4, the norming procedure resulted in somewhat different mean IQ scores, with participants scoring higher on the numerical than on the vocabulary test. In light of the somewhat younger comparison group for the numerical test and the high proportion of participants from the natural sciences, this was not unexpected. The mean vocabulary IQ was about 10 points lower than the numerical IQ and the *SD* was markedly different from the 15 points that would be expected in a perfectly representative sample. Nevertheless, the composite mean value of 115.7 seemed a reasonable estimate of the average IQ of university students.

Unexpectedly, the numerical test was only weakly correlated with the vocabulary test ($r = .13$, $p = .07$). Because reliabilities for these tests were adequate, this does not seem to result from a psychometric artifact. Also, a method bias resulting from the Internet testing does not seem likely, since this would have created an artificial but systematic source of variance resulting in *higher* correlations. First, the truncated the size of the correlation could have been due to a restriction of range. Second the lack of association between the two tests may be due to an advanced level of cognitive specialization (Lubinski, Webb, Morelock, & Benbow, 2001) in Sample 4. For example, the average numerical IQ of mathematics students was 123.8 ($SD = 12.3$) vs. 117.6 ($SD = 12.6$) for language/arts students, which is a significant difference, $F(2, 74) = 4.42$, $p = .04$. In contrast, language students had a higher vocabulary IQ than mathematics students ($M$ = 114.7 vs. 108.6, $SD$ = 8.5 vs. 8.3, respectively), $F(2, 74) = 9.52$, $p = .01$.

After a sufficient number of participants ($n \geq 20$) had completed the pretest questionnaire, same-sex dyads of minimum and maximum IQ differences were created

alternately. When a participant was assigned to the minimum difference group, a partner was selected whose IQ differed less than two IQ points. In the maximum difference group, a partner with more than 10 points difference was selected. This resulted in 38 similar and 34 dissimilar dyads, with a mean IQ difference of .6 and 18.1 IQ points, respectively ($p <$ .01). It should be noted, however, that the experimental manipulation assumes a general intelligence factor. Because of the lack of significant association between numerical intelligence and vocabulary, effects of the manipulation cannot be interpreted in this way.

Table 4

*Normed Results and Psychometric Properties of Intelligence Tests Used in Sample 4*

| Measure | Norm score (*SD*) | Comparison group | Alpha reliability |
|---|---|---|---|
| Numerical test | 121.3 (14.3) | 279 Gymnasium students (average age 17.7 years) [a] | .77 |
| Figural test (IST) | 104.3 (8.8) | 415 German young adults (age 26-30 years) [b] | .65 |
| Vocabulary test (MWT) | 110.0 (8.8) | 159 German young adults (age 20-40 years) [c] | .71 |

[a] See Wilhelm (2000)

[b] See Amthauer et al. (2001)

[c] Norm data provided by F. R. Lang (see also Lang et al. 2001)

#### 3.2.3.2 Experimental Setting and Instructions

After both partners had completed the figural test, they were brought together into a comfortably furnished experimental room. In the middle of the room, a round table with two glasses and a water carafe was placed (see Appendix 7.1). The interaction evaluation questionnaires were also placed on this table. Each participant was randomly assigned to a seat that was fixed to a place to the left or right of the table. At the other side of the room, an unobtrusive camera was attached to the wall and filmed the interaction that followed.

After the participants were seated, a second manipulation was performed. In approximately half of the dyads (39), participants were given feedback regarding the *relative* similarity of their IQ results. In 19 dyads of the similarity condition, this feedback informed them that both participants had achieved highly comparable IQ scores. In 20

dissimilar dyads, the feedback stated that IQ results had been very different. No information regarding a single individual's *absolute* intelligence level was given.

After the feedback manipulation, the student assistant asked the participants if they had any further questions and then left the room to a separate video control station, where she monitored and videotaped the interaction. Via a microphone, she remained in contact with the participants and explained that the interaction format required that the person in the right chair (seen from the camera) was first in talking about his or her important life domains. The person in the left chair was instructed to interview his or her partner about the reasons why he or she regarded this life domain as personally important.

It was explicitly stressed that the purpose of this interview was not for the interviewee to „justify" his or her life domain. Rather, the interviewer was to achieve an understanding of the subjective role of the domain in the life of the interaction partner.[20] For this purpose, questions like „Why is this life domain so important to you?" or „What do you associate with this life domain?" were suggested. The interviewer was instructed to open the interview with the standard question „About which life domain do you want to talk first?" Participants were informed that they could talk about up to three life domains in each interaction half.

After the instruction, the participant in the left chair started the interaction by playing the role of the active interviewer whose task it was to explore the subjective meaning of the other person's life domain. This interaction half was interrupted by the student assistant after 10 minutes to instruct the participants that they were to pick up the questionnaire on the table and fill out the section regarding the first interaction half (the student assistant kept monitoring the participants during this time). When the participants were ready, they proceeded to the second interaction half in which the roles of interviewer and interviewee were reversed. After this, the student assistant instructed the participants to fill out the second part of the questionnaire. When they were ready doing this, participants were thanked, debriefed, and paid.

[20] It was also stressed that the interaction did not serve to draw conclusions about the participants' level of ability. Rather, it was stressed that the study examined factors that play a role in human communication.

## 3.3 Measures

In the following, the instruments that were used to assess MU, intelligence, dispositional valuations, and control variables are described. These instruments include both psychometric instruments (summarized in Table 4) and self-report measures (summarized in Table 5).

Table 5

*Overview of Self-Report Scales Across Samples*

| Self-Report Instrument | Sample 1 | Sample 2 | Sample 3 | Sample 4 |
|---|---|---|---|---|
| Social network questionnaire | X | X | X | |
| Self-concept of peer relationships (SDQ-III) | X | X | | |
| Self-concept of intelligence | X | X | | |
| Intelligence self-rating (single item) | X | X | | X |
| Big Five (NEO-FFI) | X | X | | X |
| Big Five (BFI) | | | X | |
| Values (RVS) | | | | X |
| Interests (AIST) | | | | X |
| Loneliness (UCLA Loneliness Scale) | X | X | | |

### 3.3.1 Mutual Understanding and Related Constructs

#### 3.3.1.1 Social Network Characteristics (Sample 1-3)

Social network characteristics were sampled with a measure taken form Asendorpf and Wilpers (1998) and Neyer (1997) (see Appendix 7.2). In a first step, this measure requires participants to list all personally meaningful persons with whom they interact at least once per month. Contact persons were sampled from a wide range of family and non-family categories. Additionally, data on age, sex, duration of the relationship (between 1 = less than one year, and 4 = more than five years), and contact frequency (between 1 = once per month or less, and 5 = daily) were collected.

Table 6 summarizes some average features of the social networks of the different samples. As can be seen, Mensa participants reported an average of 16.4 network partners, whereas the university graduates reported an average of 22 to 23 partners. A similar difference was found for the category of friends, with Mensa members reporting less

friends in their social network (4.8) compared to the alumni sample (between 9.1 and 10.3). Most participants in Samples 1 and 2 mentioned their mothers and fathers as members of their social network, whereas at least half also mentioned a romantic partner. On average, the social networks people reported were quite diverse in terms of demographic variables, with a reasonably balanced age distribution and gender ratio (close to 50% in all samples).

The social network data can be compared with data from Neyer (1999), who used an almost identical (P&P) instrument as used in the present study in a sample of $N = 495$ representative German adults (aged between 17.1 and 29.8 years, $M = 24.3$, $SD = 3.7$). In this study, participants reported an average number of 17.9 ($SD = 8.5$) network partners, with 51% females. On a 3-point Likert scale, they also reported the age of their network partner and the frequency of contact. The average age score was 2.2 (i.e., close to 2 = „about the same age"), and the average contact frequency category was 2.6 (i.e., between 2 = „multiple times a month" and 3 = „once a week"). Finally, participants listed 0.9 mothers, 0.9 fathers, 0.8 partners, and 5.7 friends. As can be seen in Table 6, the network composition reported by Neyer (1999) best matches the social network of Sample 1 (Mensa members).

In a second step, participants were asked to rate every contact person according to the following dimensions (in order of appearance): *importance* (what impact would the termination of the relationship have: 1 = I would feel better, 5 = I would be strongly burdened for a long time; assessed in Sample 2 and Sample 1.I), felt *closeness* of the relationship (1 = very distant, 5 = very close), frequency of *conflict* (1 = never, 5 = almost always), opportunity for meaningful *communication* (about themes that are important to you: 1 not at all, 5 = very good), availability of *emotional support* (1 = never, 5 = for almost every problem), felt *understanding* (1 = very much misunderstood, 5 = very much understood), and felt *acceptance* (assessed in Sample 3 and Sample 1.II) (to what degree do you feel accepted by this person: 1 = not at all accepted, 5 = completely accepted).

Table 6

*Social Network Composition Across Samples*

| | Sample 1: MENSA members | Sample 2: University alumni | | Sample 3: Internet users | |
|---|---|---|---|---|---|
| | | HA | AA | | $F$ [a] |
| *k*(mother) | 0.8 (0.4) | 1.0 (0.2) | 1.0 (0.3) | 0.9 (0.4) | 11.72** |
| *k*(father) | 0.6 (0.5) | 1.0 (0.3) | 0.9 (0.4) | 0.6 (0.5) | 25.33** |
| *k*(friends) | 4.4 (4.2) | 10.6 (6.0) | 9.0 (5.4) | 3.7 (3.3) | 126.77** |
| *k*(partner) | 0.5 (0.5) | 0.7 (0.5) | 0.7 (0.5) | 0.6 (0.5) | 6.86** |
| *k*(total) | 14.2 (9.5) | 22.8 (8.5) | 21.8 (8.8) | 10.1 (6.1) | 129.48** |
| age | 39.7 (8.6) | 35.2 (4.2) | 36.8 (6.2) | 36.0 (7.2) | 21.70** |
| gender (% female) | 0.5 (0.2) | 0.5 (0.1) | 0.5 (0.1) | 0.6 (0.2) | 2.75* |
| rated intelligence | 15.9 (2.2) | 14.6 (1.7) | 14.5 (1.9) | 13.3 (2.6) | 93.19** |
| contact duration | 3.3 (0.5) | 3.2 (0.5) | 3.3 (0.4) | 3.3 (0.4) | 4.14** |
| contact frequency | 2.7 (0.7) | 2.5 (0.5) | 2.4 (0.5) | 3.1 (0.7) | 53.05** |

*Note*. *k* = average frequency of reporting a relationship category

[a] Univariate difference between samples, df (between) = 3, df (within) = 985-992

* $p = .05$ ** $p = .01$

#### 3.3.1.2 Self-concept of Social Relationships With Peers (Sample 1-2)

To measure the participants' self-assessments of the quality of their relationships with same-sex and opposite-sex peers, 8 items from the German translation of the Self Description Questionnaire III (SDQ-III; Marsh, 1992) were used (5-point Likert scale). These items were drawn from a study by Schwanzer (2002), who created short 4-item (half of them negatively framed) versions of the SDQ-III scales on the basis of item-total correlations (see Appendix 7.3). In the current study, both scales had good reliabilities (α = .81 for same-sex peers; .84 for opposite-sex peers).

#### 3.3.1.3 Loneliness (Samples 1-2)

Mixed with the SDQ-III items, 10 items from the German translation of the UCLA Loneliness Scale (Döring & Bortz, 1993) were included to measure subjective feelings of loneliness on a five-point Likert scale. Five of these items referred to social loneliness,

whereas the remaining 5 concentrated more on emotional aspects of loneliness. Because these two facets correlated very highly ($r$ = .71, $p$ = .01), they were combined into a composite loneliness score ($\alpha$ = .83).

#### 3.3.1.4 Evaluation of Dyadic Communication

After each interaction, participants completed a short questionnaire (5-point Likert scale) assessing the level of *felt understanding* (4 items, e.g., „I [the interviewee] succeeded in explaining the interviewer [me] what personal meaning the discussed life domains have for me [him/her]"), *empathic ability* of the interviewer (4 items, e.g., „It was often difficult for me [the other person] to follow the thoughts of the interviewed person [my thoughts] with my [his/her] questions)", *interaction flow* (4 items, e.g., „I did not enjoy the conversation"), and *comfort* (1 item, „I felt relaxed during the conversation"). Some of the items of this questionnaire were adapted from Hecht's (1978) Communication Satisfaction Inventory, but others were especially constructed for the current dissertation (see Appendix 7.4).

### 3.3.2 Intelligence

#### 3.3.2.1 Intelligence Ratings (Samples 1-4)

Following the ratings of social relationship quality, participants were asked to rate their own intelligence (in Samples 1-2) and the intelligence of each contact person (Samples 1-4). For this, the unpublished „Intellectual Ability Questionnaire" developed by O. Wilhelm was used (2000; see Bailey & Lazar, 1976, for a similar measure). Participants were first instructed about the intelligence distribution in the population with the help of a graphical normal curve (see Appendix 7.5). In a next step, participants were asked to rate the intelligence of every contact person as well as their own intelligence on a 1 (0-5%) to 20 (95-100%) percentile scale.

Self-ratings of intelligence have been shown to be moderately accurate in predicting psychometric intelligence. In several reviews of the relevant literature, it has been stated that the validity of self-ratings approximates .30 (Furnham, 2001; Paulhus, Lysy, & Yik, 1998). Appendix 7.6 lists some empirical studies that calculated the correlation between psychometrically measured and self-rated intelligence. As can be seen, these studies report an average correlation of .29, which is consistent with previous reviews. This value is also somewhat similar to, though slightly lower than, agreement

between self-ratings and informed acquaintances (Borkenau & Liebler, 1993: $r$ = .29; Paulhus & Morgan, 1997: $r$ = .37; but see Bailey & Mettetal, 1977b).

Especially with regard to self-ratings of intelligence, the level of predictive validity has been regarded as disappointing (Paulhus et al., 1998). Indeed, a correlation of .3 between measured and rated intelligence is considered small (Cohen, 1992). However, it should be noted that most studies using college students as participants suffer from restriction of range in intelligence, which leads to reductions of predictive correlations.[21] For example, Paulhus et al. (1998, p. 549) found a correlation of .22 between (single item) self-ratings and psychometric intelligence, but applying a correction formula[22] increased the correlation to .30-.35. In addition, intelligence rating scales are often not very reliable. Again using Paulhus et al.'s (1998) data as an example (who reported an alpha of .43 for single item ratings and .81 for the psychometric test), correcting for attenuation[23] resulted in an increase of the „true validity" of the single item ratings to levels above .50, which is more acceptable. Accordingly, the validity of single items self-ratings seems „strong enough to be useful in [nomothetic] research, if not in diagnosing individuals" (Paulhus et al., 1998, p. 549).

Because of the evidence for the (modest) validity of intelligence ratings, the current study used them as proxies for general intelligence (Studies 1-3). However, it needs to be taken in mind that intelligence ratings are biased by a number of sources. First of all, such ratings are prone to self-serving biases (Gabriel, Critelli, & Ee, 1994; Dunning & Cohen, 1992). Second, intelligence ratings have been shown to be confounded by stereotypical influences associated with number of factors, such as gender (Furnham, 2001; Rammstedt & Rammsayer, 2000), age (Furnham, 2001), and physical attractiveness (Zebrowitz, Hall, Murphy, & Rhodes, 2002). To adjust for some of these stereotypical influences, the current dissertation used the residuals of a regression analysis predicting intelligence ratings with

---

[21] For example, Paulhus et al. (1998) used the Wonderlic intelligence test; instead of the typical *SD* of 7.1, they reported a *SD* of only 4.6.

[22] $r_{xy}' = r_{xy}*\{\sigma/SD\} / \sqrt{(1 - r_{xy}^2 + r_{xy}^2*\{\sigma/SD\}^2}$, where $r_{xy}'$ is the corrected correlation, $r_{xy}$ is the uncorrected correlation, $\sigma$ is the unrestricted „true" standard deviation, and *SD* is the corresponding observed value.

[23] $r_{xy}' = r_{xy} / \sqrt{(r_{xx}*r_{yy})}$

age and gender. The degree of physical attractiveness was not measured in the current study and could thus not be corrected for.

In the current study, there were significant differences in self ratings between Samples 1 and 2, $F(3, 520) = 239.12$, $p < .01$. As expected, Mensa members (Sample 1) rated themselves as very high in intelligence ($M = 19.7$, $SD = 0.8$), followed by the highly achieving ($M = 16.3$, $SD = 2.1$) and average achieving ($M = 15.7$, $SD = 2.3$) university alumni (Sample 2). The university students comprising Sample 4 had the lowest self ratings ($M = 14.2$, $SD = 2.3$). Average ratings by all samples of university students/alumni were higher than the scale midpoint, which is not unexpected given their high educational status. As can be seen in Table 6, network partners were also rated as above-average in intelligence, with the Mensa members reporting the most intelligent partners ($M = 15.7$, $SD = 1.9$), followed by the highly achieving and averagely achieving university alumni ($M = 14.6$, $SD = 1.7$ and $M = 14.5$, $SD = 1.8$, respectively) and the Internet users (Sample 3) coming last ($M = 13.2$, $SD = 2.4$). This difference is significant, $F(3, 949) = 73.69$, $p < .01$.

#### 3.3.2.2 Self-Concept of Intelligence (Samples 1-2)

In Samples 1 and 2, the self-concept of intelligence was assessed alongside the SDQ-III scales (see Appendix 7.3) with four specifically devised items (half of them negatively formulated) that were calibrated towards a high intelligence level to avoid ceiling effects in the gifted sample (e.g., „compared to others, my level of intellectual abilities is unusually high"). This scale had a 1-5 Likert format and very good internal consistency ($\alpha = .87$).

#### 3.3.2.3 Psychometrically Tested Numerical Intelligence (Sample 4)

Numerical intelligence has been found to be a good estimate of fluid intelligence (Bickley et al., 1995), especially when tested in the context of new problems. Sample 4 took a test developed by O. Wilhelm (2000; see Appendix 7.7). This test requires participants to complete 17 series of 9 numbers. To find the solution, it is necessary to discover regularities in the first 7 numbers and then to apply this rule to the two empty slots. Item difficulties ranged from .94 (Item 4) to .53 (Item 12), with an average of .77 (average $SD = .39$). For the 144 participants who also completed the laboratory phase, alpha reliability was .77 (item total $r$s between .09 and .60), which is comparable to the .73

reported by Wilhelm (2000). The test loaded very highly on a general intelligence factor in a battery of 12 tests (Wilhelm, 2000).

#### 3.3.2.4 Psychometrically Tested Figural Intelligence (Sample 4)

As a test of figural intelligence, the Matrices subtest of the Intelligence Structure Test [Intelligenz-Struktur-Test] 2001-R (IST-2001; Amthauer et al. 2001) was used. This test is very much akin to the Raven's Progressive Matrices test (see figure *4*) that is considered as one of the best markers of fluid intelligence. The IST-2001 Matrices test consists of 18 series of 3 figures and 2 series of 8 figures that are built up according to some rule. Out of 4 alternatives, participants need to choose the figure that would complete the series. Following the manual, a time limit of 10 minutes was set for the test, which allowed participants to skip over certain items and proceed to the next one.

On average, participants answered 14.1 items, with difficulties for answered items ranging from .95 (item 1) to .16 (item 20), paralleling the values reported in the test manual. The reliability of this speeded test was calculated by correlating (using Spearman's Rho) the number of correct odd items with the number of correct even items and correcting this index with the Spearman Brown formula. This resulted in an estimated reliability of .65, which comes close to the .70 reported in the manual for students of the Gymnasium. Applying the .70 reliability criterion that is acceptable according to Nunnaly (1978), this value is somewhat low, even for a short test of 20 items. Accordingly, results based on this test should be interpreted with some caution.

#### 3.3.2.5 Psychometrically Tested Vocabulary (Samples 3-4)

In Samples 3 and 4, vocabulary was measured with the Multiple-Choice Vocabulary Test [Mehrfachwahl Wortschatztest] (MWT; Lehrl, 1995). This test consists of 35 sets of five alternative letter combinations, only one of which is a correctly spelled word. In the manual, Lehrl summarizes the results from 26 studies that report a median correlation coefficient of .71 with several global intelligence tests. In both samples, a large number of items (12 in Sample 3, 13 in Sample 4) were answered correctly by almost all participants (difficulty $\geq$ .90; Items 1, 3, 4, 6-8, 10, 11, 14-16, 22, 26), with an average difficulty of around .70 (*SD* .11). The number of correctly answered items was used as the total score ($\alpha$ = .70 in both samples).

#### 3.3.2.6 Self-Reported IQ-Test Results (Sample 1)

In Sample 1, a total number of 76 Mensa members (32%) provided the result of their latest IQ test results.[24] Although the accuracy of this information was not checked, the voluntary nature of participation in the current study makes the possibility of fake answering less likely. As expected, the mean intelligence level was very high and severely restricted ($M$ = 135.6, $SD$ = 4.4). An arbitrary cutoff of 135 (median score) was used to create a „moderately gifted" (mean IQ = 132.5, $SD$ = 1.5, $n$ = 42) and an „extremely gifted" group (mean IQ = 139.4, $SD$ = 3.6, $n$ = 34).

### 3.3.3 Dispositional Valuations

#### 3.3.3.1 Interests

Interests were measured with a short version of the German General Interests Structure Test [Allgemeiner Interessen-Struktur-Test] (AIST; Bergmann & Eder, 1992), with scales corresponding to Holland's (1959) six basic interests (see Section 2.1.3). The unpublished short version (see Appendix 7.8) included 18 items and was developed by G. Nagy from the Berlin Max Planck Institute for Human Development on the basis of a factor analysis of the original 60 items (personal communication, 2 February, 2005). The items of the short form were selected on the basis of their discriminant factor loadings (i.e., high loadings on one factor, small loadings on all other factors), which makes them better suited for the calculation of profile similarity,[25] as was done in the current study. Alpha reliabilities were mostly good (Realistic interests .81; Artistic interests .81; Social interests .80; Enterprising interests .82), except in two cases (Investigative interests .60; Conventional interests .67).

#### 3.3.3.2 Values

Values were assessed with a German version of the Rokeach Values Survey (RVS) adapted by Todt (1989). Participants were required to rank 17 end goals in terms of their

[24] In most cases, this was the Mensa admission test. Note that the IQ tests were taken at different time points, which might have influenced results because secular gains in intelligence (Flynn, 2003) lead to an underestimation of average population performance when older test norms are applied.

[25] Items loading on more than one factor reduce the variability of the different scales, resulting in relatively flat profiles.

subjective value. In the current study, the three most listed values were health, friendship, and love (rank $M$ = 5.6, $SD$ = 3.9 for health; $M$ = 5.2, $SD$ = 3.5 for friendship; $M$ = 4.8, $SD$ = 3.9 for love). The least important value in this sample was material wealth (rank $M$ = 13.0, $SD$ = 4.6). The median correlation between the different values was -.08[26], with correlations ranging between -.46 (between humanity and leisure time) and .36 (between children and family life). Because of the singe-item nature of the RVS, reliability coefficients could not be calculated. The forced (relative) independence of the RVS items provides a good basis to calculate profile correlations in order to assess the similarity in values between two persons.

#### 3.3.3.3 Openness to Experience

In Samples 1, 2 and 4, openness to experience was assessed with the German version of the NEO-Five Factor Inventory (NEO-FFF; Borkenau & Ostendorf, 1993), using a 5-point Likert scale. Sample 3 completed the German version of the Big Five Inventory (BFI; Rammstedt, 1997). To ensure BFI scales of equal length (the original instrument has 7-10 items per scale), the seven highest-loading items according to a study by Lang et al. (2001) were selected for use in the current study. With one exception, all items of the Openness scale were are formulated in the positive direction (items of the other Big Five scales are phrased in both the negative and positive direction). As can be seen in Table 7, the NEO Openness scale had quite low reliability in both the Mensa group and the alumni sample ($\alpha \leq .70$).[27] For the BFI scale, reliability was acceptable ($\alpha = .75$).

The current sample's scores on the NEO-FFI scales were compared to norm data of 1,908 representative German adults (community sample), collected by Körner, Geyer, and Brähler (2002).[28] The BFI scales were compared to a representative sample of around 1,450 German adults collected by Lang and Lüdtke (in preparation). As can be seen in

[26] The negative correlation was expected because of the forced ranking procedure (e.g., if a value gets a rank of one, other values will automatically get lower ranks).

[27] Inspection of the matrix of item-total correlations uncovered that this was mainly due to the negative item-total correlation of Item 8: „I think we should pay more attention to the opinion of our religious authorities in making ethical decisions". Contrary to the indented purpose, the open individuals in Samples 1-2 generally agreed with this item, perhaps because of its emphasis on complicated ethical problems.

[28] The Körner et al. (2002) data were deemed superior to data reported in the German NEO-FFI handbook (Borkenau & Ostendorf, 1993) that rely on a sample that is biased towards younger adults.

Table 7, all tested samples were very high in openness, placing them on average in the 94th percentile[29] of the population. One possible reason is that the current samples were characterized by high levels of intelligence and education, which are correlates of openness to experience (Ashton, Lee, Vernon, & Lang, 2000; Gignac, Stough, & Loukomitis, 2004). A second possibly is that the offer to provide personal feedback to participants attracted more psychologically-minded people high in openness. However, despite the extreme mean values, Samples 1, 2, and 4 did not seem to be restricted in range, as evidenced by the fact that the standardized *SD* was close to 1. Only in Sample 3 did the openness scale show a slight restriction in range.

## 3.3.4 Control Variables

### 3.3.4.1 Big Five (Samples 1-4)

In all samples, extraversion, neuroticism, agreeableness, and conscientiousness (i.e., the remaining four Big Five factors) were assessed as control variables. As can be seen in Table 7, the reliability of these four scales was acceptable to good. Across all samples and factors, data were quite comparable with norm data, except for neuroticism in Sample 3, where the mean score trailed almost one *SD* below the population mean. On average, the studied samples were somewhat more extraverted, emotionally stable, and agreeable than the corresponding norm groups. The range in the four remaining traits was in no way restricted in range, with values tending instead towards somewhat *higher* diversity. Comparisons between Samples 1, 2, and 4 (i.e., the samples that completed the NEO-FFI) showed significant differences in extraversion, agreeableness, and conscientiousness, $F$s (2, 710) > 17, $p$s < .01. Planned contrast showed that this was due to the lower extraversion and agreeableness of the Mensa sample compared the alumni and laboratory participants, $F$s > 13, $p$s < .01, whereas the university alumni were more conscientious than the other two samples, $F$s > 20, $p$s < .01.

[29] Estimate based on an average $z$-score of 1.55.

Table 7

*Psychometric Properties and Normed Scores of Big Five Scales Across Samples*

| | E | N | O | C | A |
|---|---|---|---|---|---|
| *Sample 1 (NEO-FFI)* | | | | | |
| Alpha | .82 | .90 | .63 | .78 | .83 |
| Mean *z* [a] | 0.04 | -0.05 | 1.75 | 0.01 | 0.04 |
| *SD* | 1.28 | 1.28 | 1.04 | 1.10 | 1.09 |
| *Sample 2 (NEO-FFI)* | | | | | |
| Alpha | .76 | .83 | .70 | .71 | .87 |
| Mean *z* [a] | -0.18 | 0.53 | 1.70 | 0.54 | 0.48 |
| *SD* | 1.02 | 1.01 | 1.08 | 0.94 | 1.03 |
| *Sample 3 (BFI)* | | | | | |
| Alpha | .90 | .85 | .75 | .82 | .72 |
| Mean *z* [b] | 0.02 | 0.34 | 1.54 | 0.38 | -0.09 |
| *SD* | 1.06 | 1.09 | 1.16 | 0.96 | 0.99 |
| *Sample 4 (NEO-FFI)* | | | | | |
| Alpha | .81 | .87 | .76 | .84 | .76 |
| Mean *z* [a] | 0.24 | 0.07 | 1.56 | -0.11 | 0.34 |
| *SD* | 1.10 | 1.11 | 1.16 | 0.99 | 0.97 |
| *Aggregated mean z* | 0.03 | 0.22 | 1.64 | 0.21 | 0.19 |

*Note*. E = Extraversion, N = Neuroticism, O = Openness, C = Conscientiousness, A = Agreeableness

[a] Norm data by Körner, Geyer, and Brähler (2002)

[b] Norm data by Lang and Lüdtke (in preparation)

### 3.3.5 Coding of MU From Behavioral Observations in Study 4

The videotaped material from Study 4 was used to assess aspects of both the individual participants' personality and the dyadic interaction that unfolded between them. In general, two kinds of procedures can be used. First, it is possible to code distinct (molecular) behaviors that occur in an interaction. Such behaviors have the advantage that they are relatively unambiguous and easy to code. Second, it is possible to use impression

ratings to assess interaction quality. Such a procedure allows judges to use all available information in an interaction (e.g., frequent smiling, touching) and integrate it into a composite rating (Cappella, 1997). Indeed, in judging rapport, this method has been recommended because of its cost-efficiency and accuracy (Bernieri & Rosenthal, 1991). For this reason, the latter method was used to assess the level of MU from the video observations.

Mutual understanding was coded by two student assistants, who were trained in the use of the coding system by the present author using 8 interaction halves as stimuli to ensure adequate reliability and internal validity. Both the training procedure and the eventual coding took place in a room with a video projector (with sound). The student assistants were equipped with computers into which they fed the ratings. The videotape was forwarded to the point where the interviewer speaks the opening sentence („About which life domain do you want to talk first“?), which served as the anchor for the start of the interaction. Every 30 seconds of the interaction, coders rated the amount of MU during the time frame that had elapsed.

The coders were instructed to rate their impression of the amount of understanding the interviewee would feel during the relevant 30-second. To achieve this, they were told to rely on two sources of information. First, they were to use the observable reactions of the interviewee. If the interviewee seemed comfortable while talking about his or her life domains, the relevant interval was rated as higher in understanding than if the interviewee was visibly strained and uncomfortable talking. Such behaviors could also consist of nonverbal behaviors, such as an „open” body posture, an interested face, etc. Second, they were to take the perspective of the interviewee into account and assess the amount of felt understanding they themselves would experience given the interviewer’s behavior during the interval.

Perceived understanding was rated on a 1 (extremely misunderstood) to 7 (extremely understood) Likert scale. Intervals in which no rating was possible (e.g., because of inadequate audio quality) were assigned a missing value. Because reliability across 30s intervals was adequate ($\alpha = .78$ across coders), both judgments were combined into a composite index of perceived understanding. After each 10-minute interaction, coders discussed their ratings with each other to re-calibrate rating criteria if necessary (yet they did not change any ratings in retrospect). When the mean value of all intervals was

aggregated across separate interaction halves, a highly reliable composite was achieved (α = .88).

## 3.4 Analysis Strategy

In addressing the hypotheses outlined above, multiple statistical techniques were used. First, because of the large number of variables that were assessed, factor analytical techniques were used to create composite scores (see Section 3.4.1). Second, many variables assessed in the current study were hierarchically related. To account for this „nested" structure, Hierarchical Linear Modeling (HLM; Bryk & Raudenbush, 1992) was used when appropriate (see Section 3.4.2). Third, Section 3.4.3 describes the calculation of difference scores and profile similarities to test dyadic effect hypotheses and discusses some of the statistical difficulties of this approach. Finally, Section 3.4.4 briefly touches upon the logic underlying the extreme group comparison.

### 3.4.1 Data Reduction

To reduce the number of independent and dependent variables, exploratory factor analyses (principal component analysis with Varimax rotation) were conducted to create composite scores whenever possible. Following conventional criteria (Eigenvalue = 1, scree plot inspection), it was tested whether the observed associations between variables can be summarized by one or more latent factors. Whenever the pattern of factor loadings was sufficiently clear-cut (i.e., high primary, low secondary factor loadings), factor scores were used in subsequent analyses.

### 3.4.2 Nested Structure of Data

A nested data structure occurs when observations are hierarchically organized, so that units on the lower-order level of the hierarchy can be characterized by their membership in some higher-order category (see Appendix 7.9, for a schematic depiction). An often-used example of such a structure comes from educational psychology, where pupils (Level 1) are nested in classes (Level 2) that are in turn nested in schools (Level 3). In the current study, social relationships assessed with the ego-centered network instrument are nested within participants. Specifically, they are organized according to two

hierarchical levels: Level 1 consists of the network partners within an ego-centered network, whereas the Level 2 units are the individual participants („egos").

According to a number of authors, HLM is ideally suited to deal with such hierarchical data because it accounts for interdependencies between different levels (Cooper, 2002; Gonzalez & Griffin, 2002; van Duijn, van Busschbach, & Snijders, 1999). To illustrate the necessity of a multilevel approach in analyzing the data from the current study, consider the following example, in which individuals differ in their calibration of the scale they use to rate people's intelligence. Individuals who have calibrated their intelligence ratings around a mean scale level of 17 may rate themselves with a 18 (+1), a friend with 15 (-2), and a colleague with 19 (+2). By comparison, individuals who have calibrated their ratings around a mean scale level of 12 may use the same relative rating pattern but arrive at difference absolute values: self-rating = 13 (+1), rating of friend = 10 (-2), and rating of colleague = 14 (+2). If the differences in calibration are a result of error variance and not of differences in network partners' „true" intelligence level, ignoring the nested structure of the network ratings would result in falsely treating the high intelligence colleague in the low-calibrated network matrix as less intelligent than the low intelligence friend in the high-calibrated network matrix.

HLM differentiates between multiple, hierarchical levels of the data. For every Level 2 unit, a separate Level 1 regression is estimated, which typically includes an intercept ($\beta_0$), at least one coefficient that describes the association between an independent and dependent variable ($\beta_1$), and an error term (random coefficient = r).[30] For example, the relation between MU and intelligence for network partner *i* of participant *j* could be described as follows:

$$MU_{ij} = \beta_{0j} + \beta_{1j} * IQ_{ij} + r_{ij} \quad (1)$$

[30] In HLM, the error term is not simply the difference between the predicted and observed score. Rather, the program uses an Empirical Bayes (EB) estimation strategy that optimally integrates the coefficients gained from an „ordinary" Ordinary Least Square regression of Level 1 units and the values of these coefficients as predicted by the Level 2 equation. This is done while taking the Level 1 data quality into account. Specially, Level 2 units that contribute very little Level 1 data points are given less weight (shrinkage). Especially when the number of Level 1 units is small, this method produces superior results (Raudenbush, 1988).

where $\beta_{0j}$ is the average[31] level of MU reported by person *j*, $\beta_{1j}$ is the average relation between IQ and MU across *j*'s social network, and $r_{ij}$ is the difference between the corresponding observed and predicted values for network partner *i*.

As stated above, a crucial feature of HLM is that it uses the Level 1 β-coefficients as outcomes in an additional regression equation at Level 2 (see Appendix 7.8). In other words, the program allows the user to specify a separate Level 2 regression from which to predict the Level 1 coefficients. For example, it can be tested whether there is a difference between men and women in their social networks' average level of MU or in the association between network partner IQ and MU. This would result in the following Level 2 equations:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}*(GENDER_j) + u_{0j} \quad (2)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}*(GENDER_j) + u_{1j} \quad (3)$$

where $\gamma_{00}$ is the average $\beta_{0j}$ coefficient in the sample (i.e., the average level of MU across all participants), $\gamma_{01}$ is the moderating relation between gender and the $\beta_{0j}$ intercept (this provides information regarding gender differences in the average level of MU), $\gamma_{10}$ is the average association between IQ and MU, and $\gamma_{11}$ is the moderating relation between gender and the IQ-MU association (for example, it may be that only men perceive a link between relationship quality and partner intelligence, whereas women do not).

Note that equations 2-3 include two Level-2 error terms: $u_{0j}$ for each individual participant's residual variance in $\beta_{0j}$, and $u_{1j}$ for the residual variance in $\beta_{1j}$. When these

[31] The interpretation of this and all other parameters depends on the scaling of the raw data. Like any other regression approach, HLM estimates the beta coefficient for one variable while controlling for all other variables in the model. The intercept thus conforms to a situation where all other parameters are set to zero. If the variables in the model are centered, this approximates the "average case". When the model includes dummy variables, the intercept corresponds to the average case of non-members of the dummy categories (e.g., when female gender is coded with 1 and male gender with 0, then the intercept corresponds to the average male).

error terms are significant, it means that there are individual differences in Level 2 parameters that are not explained by the variables in the regression model. In HLM terms, Level 1 coefficients that are allowed to vary across Level 2 units (independent of Level 2 covariates) are called random effects, whereas those who are the same for all Level 2 units are called fixed. In the above example the coefficient specifying the association between IQ and MU ($\beta_{1j}$) is a random effect because the error term $u_{1j}$ allows this effect to differ across participants. In contrast, when the individual-specific error term would have been lacking, the effect of IQ on MU would be termed a fixed effect (even though it is allowed to vary according to gender).

### 3.4.3 Testing Dyadic Effects

Dyadic effects are dependent on indices of similarity. Difference scores are the most basic form of interpersonal similarity, but they have been criticized for combining the measurement error of both constitutive elements, rendering them less reliable (Burr & Nesselroade, 1990). It should be noted, however, that the bad reputation of difference scores mostly originates from their use in longitudinal research. As is shown by Burr and Nesselroade (1990[32]), the reliability of difference scores is reduced when its components covary. In longitudinal research, it is the general rule that people's personality scores at two points in time are substantially correlated. In dyadic research, however, the degree of association between two individuals' personality scores is variable, ranging from complete interdependence to complete independence. In the latter case, difference scores are just as reliable as their constituting components (see Section 4.1.4).

The calculation of profile similarity indices has been recommended as an alternative to difference scores (Cronbach & Gleser, 1953). Such indices aggregate the differences between two or more variable pairs (e.g., by means of calculating the Euclidean distance between two persons in a multidimensional space of *k* variables). When similarity

---

[32] $r_{diff} = \frac{s_1^2 r_1 - 2 s_1 s_2 r_{12} + s_2^2 r_2}{s_1^2 - 2 s_1 s_2 r_{12} + s_2^2}$,

where $r_{diff}$ is the reliability of the difference score, $s_1$ and $s_2$ correspond to the *SD*s of the constituting variables, $r_1$, $r_2$ correspond to the reliabilities of the constituting variables, and $r_{12}$ is the correlation between them.

in more than one variable is the focus of analysis, the current study will use such indices (e.g., in the case of the $k$ = 17 Rokeach values). When similarity is the independent variable, as in the current study, a disadvantage of using profile similarity indices is that they are unspecific with regard to the explanatory power of each of their constituting elements. For example, if a dyad that is very dissimilar in terms of the Five-Factor Model experiences a lower level of MU, it is not clear whether this is related to differences in 1) extraversion, 2) neuroticism, 3) openness, 4) conscientiousness, 5) agreeableness, 6) several, or 7) all of the above. This poses a problem for testing the hypotheses of the current study that postulate an effect of specific dyadic differences on the MU process. In such cases, the only viable option is to use difference scores.

A final note needs to be made regarding the calculation of intelligence differences between gifted individuals and their network partners in Sample 1. Because these individuals are located at the extreme high end of the intelligence distribution, the magnitude of interpersonal intelligence differences depends only on the intelligence of the interaction partner. Because for Mensa members, there is no effective difference between the (rated) absolute intelligence level and relative intelligence difference ($r$ = -.94, $p$ = .01), intelligence differences could not be calculated for this sample.

### 3.4.4 Groups Comparisons

One hypothesis of the current study was that gifted individuals experience less MU in their social relationships than control individuals. For this purpose, Sample 1 was compared to the highly and averagely achieving university alumni of Sample 2. It is clear that these different samples differ on a lot of dimensions other than just intelligence. As can be seen in Table 3, Mensa members were older on average, had a slightly lower educational level, and were more likely to use the Internet questionnaire (compared to the P&P version). To account for these differences, these factors were inserted as covariates in the corresponding analyses (mainly GLM).

# 4 Chapter 4: Results

In the following chapter, results regarding the different hypotheses are reviewed. Section 4.1 presents the results of a number of factor analyses, which were used to create composite scales whenever possible. In Section 4.2, the outcomes of the hypotheses regarding main effects of fluid intelligence, crystallized intelligence, and openness to experience on the MU process are described. Section 4.3 addresses the hypotheses regarding the dyadic effects of these factors on the MU process. Finally, Section 4.4 compares gifted to non-gifted individuals in terms of their social and general adjustment.

## 4.1 Data Reduction

### 4.1.1 Ego-Centered Social Relationship Quality

#### 4.1.1.1 Samples 1 and 2

In Samples 1 and 2, participants used an ego-centered social relationships instrument (Neyer, 1997) to rate each contact person on the following dimensions: importance, felt closeness, frequency of conflict, quality of communication, emotional support, and felt understanding. Correlations between these variables ranged between -.22 (between conflict and felt understanding) and .71 (between closeness and importance).[33] Principal component factor analysis (with Varimax rotation) was performed to reduce the number of variables, which resulted in two factors with Eigenvalues greater than 1 that explained 55% and 18% of the total variance. Inspection of the unrotated factor loadings yielded clearly interpretable factors (see Table 8), with high primary ($\geq|.74|$) and low secondary loadings ($\leq|.34|$). Accordingly, a Relationship Quality Scale was formed by averaging the items loading on the first factor, which had very good reliability ($\alpha = .87$). Because the current study was only interested in MU as an indicator of relationship quality, the conflict item that dominated the second factor was not used in further analyses.

[33] Because the current study was not interested in possible idiosyncratic differences in evaluations of relationship quality, these analyses ignored the nested structure of the data, treating Level 1 relationships as the information unit.

Table 8

*Loadings of Social Relationships Ratings on Relationship Quality Factors in Samples 1-3*

| | Identified Factors | | | | |
|---|---|---|---|---|---|
| | Sample 1.I-2 | | Sample 3 | Sample 1.II [a] | |
| | Quality | Conflict | Quality | Quality | Conflict |
| Importance [b] | **.74** | .34 | | | |
| Closeness | **.84** | .19 | **.80** | **.78** | .29 |
| Conflict | -.17 | **.90** | **-.41** | -.29 | **.92** |
| Communication | **.76** | -.26 | **.84** | **.84** | .04 |
| Support | **.85** | .12 | **.79** | **.77** | .30 |
| Understanding | **.85** | -.20 | **.85** | **.84** | -.10 |
| Acceptance [b] | | | **.79** | **.79** | -.18 |
| % explained variance | 55% | 18% | 58% | 56% | 18% |

*Note*. Factor loadings greater than .4 printed in bold.

[a] Results are only based on the analysis of Mensa members' responses

[b] The importance item was not assessed in Samples 1.II and 3, whereas the acceptance item was not assessed in Samples 1.I and 2

#### 4.1.1.2 Sample 1.II

In Sample 1.II, the ego-centered relationships questionnaire was supplemented with an item measuring the amount of acceptance felt in the relationship but did not longer include an item measuring the importance of the relationship (all other items remained the same as in Sample 1-2). As can be seen in Table 8, a factor analysis of all items resulted in a clear two factor structure, explaining 56% and 18% of all variance. Because of the incomplete overlap of items between Samples 1-2 and 1.II, coefficients of congruence could not be calculated to quantify factor resemblance. However, inspection of the factor loadings in Table 8 suggests clearly comparable factors. Like in Sample 1-2, a Relationship Quality scale was formed by averaging all items that loaded highly on the first factor ($\alpha = .86$).

#### 4.1.1.3 Sample 3

Sample 3 completed the same relationship questionnaire as Sample 1.II (i.e., with acceptance but without importance ratings). Factor analysis of these items showed that,

unlike in Sample 1-2 and 1.II, all evaluative items, including the ratings for conflict frequency, loaded on a single factor. However, because the (absolute) factor loading for conflict (.41) was considerably lower than for the other items (range .78-.85) and to improve comparability with the composite measures collected in Samples 1 and 2, it was decided to treat conflict as a separate dimension of relationship evaluation and to average the remaining items in a composite scale with excellent reliability ($\alpha = .87$).

## 4.1.2 Post-Interaction Ratings in Sample 4

In Sample 4, after the end of their conversation, participants completed the interaction evaluation questionnaire (see Appendix 7.4). The items of this post-interaction questionnaire were factor-analyzed to reduce the number of variables. Results of this analysis are presented in the following section.

### 4.1.2.1 Assessment of Conversation Quality

The post-interaction questionnaire items were factor-analyzed separately for each interaction role (i.e., interviewer/interviewee). Table 9 shows the factor solutions for the participants' evaluations of the interviewer, separately for self-ratings and partner-ratings. As can be seen, analysis of interviewers' self-ratings resulted in a three-factor solution that explained 55% of the total variance. In contrast, analysis of the interviewees' ratings of the interviewers' behavior resulted in two factors that explained 53% of the variance.

The factor loadings of the self-ratings of the active interviewer role are displayed in the left three columns of Table 9. As can be seen, the first factor was dominated by items that tap into a successful understanding of the interview partner. Participants with high scores on this factor stated they could comprehend their partners well and had the impression that their partners were successful in explaining the meaning of their life domains. Accordingly, this factor was labeled *Interviewer Understanding* (IU). The second factor was dominated by items emphasizing a smooth, pleasant and synchronized conversation. This factor was labeled *Interviewer Flow* (IF). Finally, the third factor was almost exclusively dominated by the (reverse coded) dissatisfaction item. This factor was labeled *Interviewer Satisfaction* (IS).

As stated above, the factor analysis of the ratings for the interaction half in which the participants played the role of interviewee only resulted in a two-factor solution. An inspection of the factor loadings shows that the first factor was dominated by items

expressing satisfaction with the interviewer's behavior (e.g., saying the right things, providing ample opportunity to explain the importance of life domains) and a subjective feeling of being understood. Accordingly, this factor was called *Partner Understood* (PU). The second factor was characterized by items that emphasized a smooth, relaxed, and satisfactory conversation. This factor was labeled *Partner Flow* (PF).

Despite the similar labeling of the first two factors of the post-interaction ratings of conversation quality, there were differences in accent. Indeed, coefficients of congruence between the first two factors were .85 for the first and .75 for the second factor, suggesting broadly similar, but by no means identical factors. Inspection of the factor loadings showed that this was mainly caused by Item 2 (interviewer made constructive remarks) and 8 (interviewer followed up on the interviewee's thoughts). Whereas these items loaded on the Flow factor of the interviewer ratings, they contributed to the Understood factor of the partner-ratings. Presumably, this is due to the fact that interviewers can discriminate between (covert) subjective understanding and (overt) communicative behavior (e.g., it is possible to understand another person without succeeding to communicate this feeling to him/her), whereas the interviewee cannot. For both interaction halves, participants' factor scores on the interviewer and interviewee "Understanding" factors were used as variables in subsequent analyses.

#### 4.1.2.2 Effect of Manipulation on Intelligence Ratings

As stated previously (Section 3.2.3), an experimental manipulation was carried out before the participants started to interact. Specifically, in half of the interactions ($n$ = 39), participants were given feedback about the relative difference in measured intelligence between them. In half of these cases ($n$ = 19), they were told that the test had indicated a large intelligence difference between them, whereas in the other half ($n$ = 20), they were told that there were only minimal differences. It was expected that this manipulation would affect perceived intelligence differences, so that participants in the difference-feedback condition would perceive a lot of differences, whereas participants in the similarity-feedback condition would not.

Table 9

*Loadings of Ratings of Interviewer Behavior on Conversation Quality Factors in Sample 4*

| | | Self-rated interviewer behavior | | | Partner-rated interviewer behavior | |
|---|---|---|---|---|---|---|
| Item | Content | IU | IF | IS | PU | PF |
| 1 | I [the interviewer] could comprehend well why the discussed life domains are so important to my interview partner [me] | **.80** | .00 | .11 | **.66** | .31 |
| 2 | I [the interviewer] often said things that did not contribute much to the conversation (R) | .00 | **.65** | -.31 | **.69** | .05 |
| 3 | This conversation half went smoothly | .01 | **.73** | .24 | .20 | **.82** |
| 4 | The interviewee [I] succeeded in explaining the interviewer [me] what personal meaning the discussed life domains have for him/her [me] | **.79** | .13 | .26 | **.61** | .30 |
| 5 | I [the interviewer] showed great interest in the things my interviewer partner [I] said | **.59** | **.46** | -.08 | **.57** | **.41** |
| 6 | I did not enjoy the conversation (R) | **.43** | .32 | .37 | .19 | **.56** |
| 7 | My conversation partner [I] had little opportunity to explain why certain life domains are important to him/her [me] (R) | **.60** | .02 | .01 | **.75** | -.01 |
| 8 | It was often difficult for me [the other person] to follow the thoughts of the interviewed person [my thoughts] with my [his/her] questions (R) | .21 | **.72** | .01 | **.67** | .22 |
| 9 | I felt relaxed during this conversation half | .27 | **.62** | .30 | .27 | **.82** |
| 10 | I [the interviewer] showed my conversation [me] partner that I [he/she] understood, what he/she [I] said | **.49** | .31 | -.14 | **.72** | .32 |
| 11 | I was very dissatisfied with the conversation (R) | .04 | .02 | **.85** | .06 | **.62** |

*Note*. Factor loadings greater than .40 printed in bold.

IU = Interviewer Understanding, IF = Interviewer Flow, IS = Interviewer Satisfaction, PU = Partner Understanding, PF = Partner Flow, (R) = reverse coded

The effectiveness of the experimental manipulation was tested with a t-test of the difference between independent sample means. Specifically, participants in dyads who were told to be very similar in intelligence were compared to participants in dyads who were told to be different. As the dependent variable, the absolute difference between participants' ratings of themselves and their partners was used (i.e., perceived difference). Because the dependent variable varied across individual participants (in contrast to the experimental manipulation, which varied across dyads), the model was tested with participants as between-subjects unit ($n$ = 77). In contrast to expectations, however, results did not show a significant difference between the two feedback groups, $t(76) = 1.08$, $p$ = .14 (one-sided). Accordingly, the manipulation was deemed a failure and its effects were not further analyzed.[34]

### 4.1.3 Agreement Across Data Sources

To assess data quality, the level of agreement across data sources was calculated. First, it was tested whether persons who thought they were very understanding as interviewers actually had partners who felt understood during that interaction half. In addition, self- and partner-ratings were correlated with the aggregated MU observations by the student assistant judges. Table 10 shows the results of these analyses. As can be seen, all correlations were positive and at least marginally significant. Specifically, if interviewers reported being very understanding, their interaction partners felt better understood during the corresponding interaction half ($r$s = .31 and .26 for the first and second interaction halves, respectively). In addition, both partners' impression of the degree of MU was corroborated by the observational ratings, with correlations ranging between .22 and .36 (all $p$s $\leq$ .10).

[34] The student assistant in charge of the experiment rated the intelligence of both interaction partners in 114 out of 144 cases. As the assistant also assigned the participants to similar or dissimilar dyads on the basis of their intelligence score, it is no surprise that this impacted her ratings. In line with expectations, she perceived an average difference of .82 points in similar dyads, against 1.38 points in dissimilar dyads, which is statistically significant, $F = 10.37$, $p = .01$.

Table 10

*Correlations Between Self-Reported and Observed Indices of MU*

| | IU(2) | PU(2) | PU(1) | MU(1) | MU(2) |
|---|---|---|---|---|---|
| IU(1) | .12 | .27* | .31** | .22† | .23† |
| IU(2) | | .26* | .66** | .31** | .28* |
| PU(2) | | | .14 | .22† | .36** |
| PU(1) | | | | .34** | .30** |
| MU(1) | | | | | .74** |

*Note*. IU = Self-rated understanding as interviewer, PU = felt understanding as partner, MU = mutual understanding rated by outside observers; index of interaction half in brackets

** $p < .01$, * $p < .05$, † $p < .10$

To obtain at a dyadic measure of MU, a factor analysis of both participants' self-rated Interviewer and Interviewee Understanding, and the amount of observed MU for each interaction half (i.e., six variables) was conducted. Inspection of the scree plot suggested a one-factor solution, with the first factor explaining 45% of the variance, and factor loadings ranging between .50 and .76. Accordingly, the average of these six variables was taken as a composite index of MU, which had an acceptable reliability ($\alpha$ = .74), especially considering the heterogeneity of information sources. In addition, similar composite indices were created for each interaction half (because these consisted of only three items each, reliabilities were deflated to .54 and .57 for the first and second half, respectively).

### 4.1.4 Interdependence of Data

An important issue in using dyadic data is that the individual members of the dyad can be interdependent. That is, for whatever reason, members may resemble each other in terms of certain characteristics. Failing to account for this interdependency may lead to biased conclusions (Kenny & la Voie, 1985). Because the dyads were formed unsystematically (with the exception of pretest intelligence) and did not have contact previous to the interaction, interdependence in Study 4 can only be due to the interaction itself (e.g., when both participants act in a relaxed way because of a nice conversation).

Accordingly, no dyadic associations between partners on any of the pretest measures were expected.

In line with the expectation of non-interdependence, (intraclass) correlational analyses showed that correlations between participants' crystallized and fluid intelligence scores ranged between -.11 and .03 and were not statistically significant, *p*s > .30. Similarly, openness to experience did not correlate across interaction partners, $r = -.05$, $p = .69$. Finally, both participants' self-ratings and partner-ratings were uncorrelated between dyadic partners, $r = -.05$ and .02 (*p*s > .60), respectively. Accordingly, it was not necessary to account for dyadic interdependency regarding the current predictor variables.

Because the data were virtually non-interdependent, applying the formula by Burr and Nesselroade (1990) results in estimates of the reliability of the difference scores between two participants that approximate the reliability of the corresponding scales. The only exception is the difference between participants' self-ratings of intelligence and their ratings of the intelligence of their interaction partners, which were significantly correlated ($r = .40$, $p < .01$). When the reliability of the single-item measure is estimated at .70, then the reliability of the (intra-individual) difference score does not exceed .50. Of course, the low reliability of the intra-individual difference score also affects the results of Studies 1-3.

## 4.2 Main Effects of Intelligence and Dispositional Valuations

The current study tested a number of hypotheses regarding the main effects of intelligence and dispositional valuations on the level of MU in social relationships. Specifically, it was hypothesized that fluid intelligence, crystallized intelligence, and openness to experience are positively related to MU.

### 4.2.1 Samples 1-2

To address the main effect hypotheses regarding fluid intelligence and openness to experience on the amount of MU in relationships (Main Effect Hypothesis 1 and 3, respectively), the ego-centered network data were analyzed using HLM. On the relationship-specific Level 1, the composite relationship quality index served as the dependent variable. The intercept (i.e., average level of relationship quality within a

person's social network) served as outcome variables in a participant-specific Level 2 regression. As predictors of the intercept[35], self-rated intelligence and openness to experience were included. All continuous Level 2 variables were standardized to facilitate comparison of the HLM coefficients. Level 2 random effects were included for both intercept and the IQ x relationship quality slope parameter. In addition, gender, age, and network size[36] were entered as control variables on Level 2.

Table 11 shows the regression coefficients of the HLM analysis of main effects in Samples 1-2 and 3. As can be seen, the Table is divided into two horizontal halves covering the different samples. The first line of each half specifies the Level 2 intercept (the average relationship quality), followed by the slope of the association between rated intelligence and relationship quality. In lines 2-5, Level 2 moderators of the Level 1 intercept are displayed. For example, in Sample 1-2, an elevation of 1 *SD* in Openness increases the Level 1 intercept by .04 points.

As can be seen in Table 11, the parameter linking partner intelligence with relationship quality was significant and positive on Level 1, indicating that relationships with more intelligent network partners were rated as higher in quality. Thus, Main Effect Hypothesis 1 was confirmed regarding the relationship-specific Level 1. In contrast, self-rated intelligence on Level 2 had a significantly negative influence on the average level of relationship quality. That is, highly intelligent individuals reported less satisfying and understanding relationships, which is inconsistent with Main Effect Hypothesis 1. Finally, participants' openness to experience was positively related to average relationship quality on Level 2, but this effect was not significant. Accordingly, Main Effect Hypothesis 3 was not supported.

[35] No covariates were included as predictors of the intelligence rating x relationship quality slope because the analysis focuses on main effects, not on moderator effects.

[36] Network size was included as a control variable to avoid diluting effects: If participants are not very selective in listing contact persons, they are more likely to include less intimate relationships, which might lead to decreased mean levels of relationship quality.

Table 11

*HLM Regression Coefficients of the Effect of Rated Intelligence, Openness, and Vocabulary on Relationship Quality in Samples 1-2 and 3*

| | Level 1 (relationship partner) | |
|---|---|---|
| | Relationship quality intercept | Rated partner IQ slope |
| | *Sample 1-2* | |
| | 0.00 | 0.40** |
| *Level 2* | | |
| -Openness | 0.04 | |
| -Self-rated IQ | -0.21** | |
| -Network size | -0.07** | |
| -Age | -0.01 | |
| -Female gender | 0.03 | |
| | *Sample 3* | |
| | -0.20** | 0.41** |
| *Level 2* | | |
| -Openness | 0.01 | |
| -Vocabulary | -0.05 | |
| -Network size | -0.04* | |
| -Age | -0.06* | |
| -Female gender | 0.28** | |

*Note*. IQ = intelligence rating, corrected for age and gender. All continuous variables were standardized before entering in the analysis. In Samples 1-2 (Level 1, $N$ = 7,863; Level 2, $N$ = 410), random effects were estimated at .36, .20, and .86 for the Level 1 intercept, the IQ x relationship quality slope, and the residual variance, respectively ($p$s < .01). In Sample 3 (Level 1, $N$ = 5,153; Level 2, $N$ = 511), the corresponding estimates were .50, .22, and .79 ($p$s < .01).

** $p$ < .01, * $p$ < .05

In the current case, there were extreme differences between the Mensa (Sample 1.I) and alumni (Sample 2) in the mean level and range of the single item intelligence rating. Specifically, the average (single-item) self-rated intelligence was 19.7 for the Mensa members against 16.2 for the university alumni, a highly significant difference, $F(1, 431) = 555.74$, $p = .01$. In addition, Mensa members had a *SD* of .62 on the single item rating, whereas university alumni had a *SD* of 2.15. An *F*-test showed that this difference is significant, $F(221, 219) = 3.49$, $p = .01$. Because of these large differences in distribution, the single item intelligence rating is confounded with sample membership (i.e., a participant with a self-rating of 20 points almost certainly belongs to the Mensa sample).

Because of the potentially unmeasured selection bias accompanying Mensa membership (besides having a high intelligence), the single item intelligence rating scale is not ideal to test for the effects of intelligence on social relationships. Sample differences regarding the four-item intelligence self-concept scale were comparably smaller, though significant, $F(1, 435) = 82.47$, $p < .01$, whereas the *SD* of this scale did not differ between the Mensa members (*SD* = .68) and the university alumni (*SD* = .73), $F(222, 223) = 1.09$, $p = .26$. When the single-item intelligence ratings were replaced with the intelligence self-concept scale, no significant effect on the relationship quality intercept was found ($p = .27$), even though the trend was again negative ($b = -0.03$). Accordingly, the negative effect of intelligence self-ratings found for the single item measure was not replicated for the intelligence self-concept scale.

In sum, a negative/null association between participants' self-rated intelligence and their social network's average level of MU was found on Level 2. In contrast, a positive association between participants' rating of their network partners' intelligence and the quality of their relationship was found on Level 1. Thus, results differed between the relationship-specific (dyadic) Level 1 and the participant-specific Level 2. In interpreting this discrepancy, it should be noted that these two levels are mathematically independent of each other and represent different research questions. For example, whereas the Level 2 association between rated intelligence and MU is dependent of the relationship quality intercept, the association on Level 1 is independent of this parameter.

### 4.2.2 Sample 1.II

Like in Sample 1.I, 39 Mensa members filled out the NEO-FFI personality questionnaire, provided a list of their network partners and rated each partner's intelligence and the quality of the corresponding relationship. In addition, a total of 172 network partners rated their own openness to experience and intelligence as well as the quality of the relationship with the Mensa member. Because the intelligence self-ratings of the Mensa members did not show any variation, they could not be used to assess main effects. In addition, it turned out that also the network partners' ratings of the Mensa members' intelligence were extremely right skewed (kurtosis -2.35, se .18, $p < .01$). As 42% of the network partners used the highest or second-highest intelligence rating (i.e., 19 or 20), many were apparently aware of the gifted status of the Mensa members, most likely because of their publicly known membership in an organization for the gifted. Because the intelligence ratings of the network partners were highly confounded with the availability of this information, they were not further used in the subsequent analyses.

Because two rating sources (Mensa members and network partners) for both dependent and independent variables were available, main effects were tested with four separate HLM analyses. The dependent variable in these regressions was the amount of relationship quality, predicted by ratings of partner intelligence while controlling for the total size of the social network and participants' gender.[37] Table 12 shows the outcomes of these analyses. Note that this Table is divided into four rows, depending on the source and the target of the intelligence and relationship quality ratings (in the Table, the source of a rating is placed left of colon, whereas the target is placed on the right; in the case of self-ratings, source and targets are identical). As can be seen, the effects of intelligence ratings on relationship quality were only statistically significant when the Mensa member provided *both* intelligence *and* relationship quality ratings. Because the positive association between intelligence and relationship quality ratings found in Samples 1.I and 2 was only replicated in one out of four possible analyses, Main Effect Hypothesis 1 received only weak support.

[37] Different from the previous analyses, age was not included because the relatively high number of missing values for this variable would have reduced the already limited sample size.

Table 12

*HLM Regression Coefficients of the Effect of Ratings of Network Partner Intelligence on Relationship Quality in Sample 1.II*

| | Level 1 (relationship partner) | |
|---|---|---|
| | Relationship quality intercept | Rated partner IQ slope |
| | *MM: Quality/MM: IQ* | |
| | 0.24 | 0.24** |
| *Level 2* | | |
| -Network size | 0.00 | |
| -Female gender | 0.04 | |
| | *MM: Quality/NP: IQ* | |
| | 0.40** | -0.05 |
| *Level 2* | | |
| -Network size | -0.03 | |
| -Female gender | -0.06 | |
| | *NP: Quality/MM: IQ* | |
| | 0.01 | -0.04 |
| *Level 2* | | |
| -Network size | -0.01 | |
| -Female gender | 0.02 | |
| | *NP: Quality/NP: IQ* | |
| | 0.02 | -0.07 |
| *Level 2* | | |
| -Network size | 0.00 | |
| -Female gender | -0.02 | |

*Note*. MM = Mensa member, NP = network partner, IQ = intelligence rating, corrected for age and gender. All continuous variables were standardized before entering in the analysis. Level 1, $N = 172$; Level 2, $N = 39$. Mean random effects (across all four analyses) were estimated at .26, .10, and .89 for the Level 1 intercept, the IQ x relationship quality slope, and the residual variance, respectively ($ps \leq .36$). The table is divided into four horizontal parts, depending on the source (left of colon) and target , whereas the target (right of colon) of the intelligence ratings rating

** $p < .01$, * $p < .05$

### 4.2.3 Sample 3

Like in Samples 1-2, a HLM analysis with vocabulary and openness as Level 2 main effect variables and rated network partner intelligence as Level 1 main effect variables was carried out. Instead of intelligence self-ratings (not assessed in this Sample), the vocabulary test score was included as a measure of crystallized intelligence. Like in the previous analyses, gender, age, and total network size were included as Level 2 covariates.

Table 11 (lower part) shows the results of the HLM analysis. As can be seen, neither the effect of vocabulary nor the effect of openness was significant on Level 2. As found in Samples 1-2, however, the main effect of rated partner intelligence on relationship quality was significant and positive. This is consistent with Main Effect Hypothesis 1, which predicts that intelligence and relationship quality are positively associated.

In sum, results for Sample 3 resulted in positive results for Main Effect Hypothesis 1, but no support for Main Effect Hypotheses 2 and 3. Consistent with Main Effect Hypothesis 1 and replicating results from Samples 1-2, participants' ratings of their network partners' intelligence (on Level 1) were positively associated with relationship quality. In contrast, vocabulary level as assessed with a psychometric test (on Level 2) was not associated with relationship quality, which disconfirms Main Effect Hypothesis 2. Finally, self-ratings of openness to experience (on Level 2) were not significantly associated with relationship quality, which disconfirms Main Effect Hypothesis 3.

### 4.2.4 Sample 4

According to the current Main Effect Hypotheses, MU should be positively related to intelligence, vocabulary, and openness to experience. In Sample 4, self-ratings, ratings by the interaction partner, and intelligence test results were available as information sources for fluid intelligence. In addition, vocabulary was measured with the help of a psychometric test (MWT), and openness with an established self-rating instrument (NEO-FFI). The level of observed and self-reported MU after the interaction served as dependent variable.

The intercorrelation matrix of the different predictor measures (see Table 13) was inspected to see whether it would be possible to create aggregated variables. As can be seen, self-ratings of intelligence were significantly correlated with psychometric numerical intelligence and openness to experience. Vocabulary was significantly correlated with

openness to experience and marginally significantly with numerical intelligence. These correlations are consistent with previous research (e.g., Ashton et al., 2000; Paulhus et al., 1998), but they are not high enough to create composite measures.[38] Unexpectedly, partner-ratings of intelligence and figural intelligence were unrelated to the other predictor variables.[39]

Table 13

*Correlations Among Predictor Variables in Sample 4 (Intelligence and Openness to Experience)*

| | IQ SR | IQ PR | IQ NUM | IQ VOC | IQ FIG | O |
|---|---|---|---|---|---|---|
| IQ SR | 1.00 | .03 | .23** | -.03 | .04 | .20* |
| IQ PR | | 1.00 | -.01 | -.05 | -.03 | -.11 |
| IQ NUM | | | 1.00 | .13† | .10 | .04 |
| IQ VOC | | | | 1.00 | .01 | .17* |
| IQ FIG | | | | | 1.00 | -.05 |
| O | | | | | | 1.00 |

*Note*. IQ SR = Self-rated IQ, IQ PR = Rating by interaction partner IQ, IQ NUM = numerical IQ, IQ FIG = figural IQ, IQ VOC = Vocabulary, O = Openness. *N*s ranged from 139 (correlations with intelligence ratings) to 200 (correlations among pretest measures).
** $p < .01$, * $p < .05$, † $p < .10$

Main effects in Sample 4 were tested by a series of correlational analyses. As can be seen in Table 14, main effects were limited to partner-ratings of intelligence, and psychometrically assessed vocabulary. Interestingly, main effects differed between *participants* (i.e., first vs. second interviewer) but generalized across interaction *halves*

[38] Applying the Spearman-Brown formula shows that aggregating scales that are significantly correlated (e.g., self-ratings of intelligence and numerical intelligence) would result in inadequate reliability levels (i.e., alpha levels lower than .37).

[39] The lack of associations with partner intelligence could be due to the limited amount of information on which participants could base their judgments. The lack of association with figural intelligence may be due to range restriction and the fact that this measure was based on a speeded test, whereas the other intelligence measures were not.

(i.e., first vs. second half). That is, effects that were found for the first interviewer were not replicated for the second interviewer (and vice versa), but the effects (and lack of effects) of both persons' personality were not constrained to one interaction half.

Across both interaction roles and interaction halves, two main effects of intelligence were significant. To begin with, the first interviewer's level of vocabulary was significantly positively related to MU during the conversation. The positive effect of crystallized intelligence is consistent with Main Effect Hypothesis 2. However, no effect was found for the second interviewer's vocabulary. Second, the rating of the first interviewer's intelligence by his or her interaction partner was positively related to MU. However, no effect was found for the first interviewer's ratings of the intelligence of the second interviewer. Besides the effects of the first interviewer's vocabulary level and intelligence ratings by his/her partner, no other personality variables exerted a significant main effect on MU. That is, no significant main effects were found for self-ratings of intelligence, psychometric (figural, numerical) intelligence, or self-reported openness to experience.

Table 14

*Correlations Between Intelligence/Dispositional Valuations and MU in Sample 4*

| | Target of personality assessment | | | | | |
|---|---|---|---|---|---|---|
| | Interviewer(1) | | | Interviewer(2) | | |
| Source | MU | MU(1) | MU(2) | MU | MU(1) | MU(2) |
| Intelligence ratings | | | | | | |
| -Self-rating | -.12 | -.19 | -.01 | .08 | .15 | -.01 |
| -Rating by partner | .35** | .35** | .28** | -.07 | -.09 | -.04 |
| Intelligence tests | | | | | | |
| -Numerical IQ | -.04 | .00 | -.08 | .08 | .07 | .07 |
| -Figural IQ | -.03 | -.03 | -.02 | -.03 | -.03 | -.01 |
| -Vocabulary | .30** | .27** | .27** | -.03 | -.06 | .01 |
| Openness to experience | .13 | .14 | .09 | .12 | .15 | .06 |

*Note*. MU = Composite measure of self-reported and observed mutual understanding (interaction half in brackets)

** $p < .01$, * $p < .05$

In sum, Main Effect Hypothesis 1 received weak support, with the ratings of the first interviewers' intelligence by their partners being positively related to MU, but not the ratings of the second interviewers' intelligence. Because the positive association between intelligence and MU was not replicated with other intelligence indices, this finding does not seem very robust, however. Second, Main Effect Hypothesis 2 received mixed support, with the level of vocabulary being positively associated with MU for the first but not for the second interviewer. Third, Main Effect Hypothesis 3 received no support since openness to experience was not related to the level of MU.

## 4.3 Dyadic Effects of Intelligence and Dispositional Valuations

In the following section, the current study's dyadic effect hypotheses are addressed. As a reminder, the prediction was made that between-person differences in intelligence and dispositional valuations are related to impairments in the MU process. Specifically, this involved the following variables:

> Dyadic Effect Hypothesis 1: Between-person differences in fluid intelligence are negatively related to MU.
>
> Dyadic Effect Hypothesis 2: Between-person differences in crystallized intelligence are negatively related to MU.
>
> Dyadic Effect Hypothesis 3: Between-person differences in openness to experience are negatively related to MU.
>
> Dyadic Effect Hypothesis 4: Between-person differences in interests and values are negatively related to MU.

### 4.3.1 Sample 1.I

Because the extremely high intelligence level of the Mensa members makes it impossible to discriminate between main and dyadic effects in this sample (see Section 3.4.3), no tests of dyadic effects were conducted (for tests of main effects, see Section 4.2).

### 4.3.2 Sample 1.II

Because of the previously discussed problems with the self- and partner-ratings of intelligence of the Mensa members (see Section 3.4.3), these indices could not be used to test dyadic effects. In contrast, both dyadic partners completed the Openness to Experience scale of the NEO-FFI, so this information was available to calculate absolute difference scores that were used in three HLM analyses. First, an analysis was carried out to assess the effect of between-person differences in openness on a composite index of relationship quality (average of both dyadic partners' ratings). However, because the degree of convergence across both raters was only modest ($r$ = .24, $p$ = .01), two separate HLM analyses were calculated to assess the impact of between-persons difference in openness on each participant's idiosyncratic relationship quality ratings. As was done for the test of main effects in this sample (see Section 4.2.2), Mensa members' gender and network size were included as control variables.

Inconsistent with Emergent Effect Hypothesis 4, results did not show any effects of between-person differences in openness on any of the three relationship quality indices. Specifically, the absolute difference score of the two dyadic partners' openness values were neither associated with the average of both persons' relationship quality ratings ($b$ = -.07, $p$ = .40), nor to partners' idiosyncratic quality ratings ($b$s = -.02 and -.11 for Mensa members' and relationship partners' quality ratings, respectively, $p$s > .20).

### 4.3.3 Sample 2

In Sample 2, dyadic effects were studied in the following way. For every relationship, the difference between the university alumni's self-reported intelligence and their ratings of their network partners' intelligence was calculated. This difference score had an average of 2.7 ($SD$ = 3.2), indicating that the alumni saw themselves as more intelligent than the people with whom they frequently interacted. To calculate the impact of between-person intelligence differences, the absolute value of this difference score was

inserted in an HLM analysis as a Level 1 predictor of relationship quality.[40] As before, age, gender, and network size were entered as control variables.

Table 15 shows the results of the HLM analysis for the effects of absolute differences scores on the quality of social relationships. As can be seen, there was a significantly negative effect of absolute intelligence differences on relationship quality. Thus, when participants perceived larger between-person differences in intelligence, they also perceived the quality of the social relationship as lower, which is consistent with Dyadic Effect Hypothesis 1.

In only 4.3% of all relationships, participants rated their network partners as more than one scale point higher in intelligence than themselves (vs. 57.8% lower in intelligence). As a result, if there is a detrimental effect of intelligence differences when the network partner is rated as *more* intelligent, this is likely obscured by the sheer number of relationships where the opposite is the case. Because of the bias towards higher self-ratings, the difference score can also be seen as an index of the *degree* to which contact persons have a *lower* intelligence than the alumni.

To test the notion that communication is also hampered when a contact person has a higher intelligence level, two additional dummy variables were created. First, a dummy was created for all dyads in which participants rated a contact person as more than one scale point *lower* in intelligence than themselves (this concerned 5,006 dyads). The same was done for dyads in which participants rated a contact person as more than one scale point *higher* in intelligence (this concerned 376 dyads). Results showed that the dummy that specified relationships in which the network partner was rated as less intelligent was associated with lower levels of relationship quality ($b$ = -.49, $p$ = .00). In contrast, there was a non-significantly positive effect of the dummy that specified relationships in which the network partner was rated as more intelligent ($b$ = .15, $p$ = .25).

Although the lack of significance for the dummy specifying relationships with more intelligent network partners may be the result of unequal cell sizes, the positive sign clearly disconfirms Dyadic Effect Hypothesis 1, which states that differences in intelligence

[40] Because the difference score varies across different relationships, it was deemed a Level 1 property. Note, however, that intelligence differences calculated in this way are not pure Level 1 measures because they are dependent on Level 2 information (i.e., the self-rated IQ of the university alumni).

should be related to *lower* levels of MU. Instead, the pattern of findings is more consistent with a positive main effect of participants' ratings of their network partners' intelligence.

In sum, the Dyadic Hypothesis that intelligence differences between persons are related to lower levels of MU received modest support. True, when participants perceived network partner as lower in intelligence than themselves, the relationship was rated as lower in quality. Yet the crucial prerequisite for a demonstration of a dyadic effect (lower quality ratings for relationships with network partners that are perceived as *higher* in intelligence) was not met in the current study. Accordingly, the significant „dyadic" effect of intelligent difference is more likely due to a main effect of rated intelligence on social relationship quality.

Table 15

*HLM Regression Coefficients of the Effect of Between-Person Differences in Rated Intelligence and Relationship Quality in Sample 2*

| | Level 1 (relationship partner) | |
|---|---|---|
| | Relationship quality intercept | Between-person IQ difference slope |
| | -0.03 | -0.29** |
| *Level 2* | | |
| -Network size | -0.08** | |
| -Age | 0.01 | |
| -Female gender | 0.10* | |

*Note*. IQ = intelligence rating, corrected for age and gender. All continuous variables were standardized before entering in the analysis. Level 1, $N = 4{,}537$; Level 2, $N = 205$. Mean random effects (across all four analyses) were estimated at .30, .19, and .90 for the Level 1 intercept, the IQ x relationship quality slope, and the residual variance, respectively ($ps < .01$).

** $p < .01$, * $p < .05$

### 4.3.4 Sample 4

In Sample 4, univariate between-person differences in intelligence and dispositional valuations were operationalized as the absolute difference between interaction partners' scores. Second, the Euclidean distance between interaction partners' personality profiles

was calculated as an index of multivariate between-person differences.[41] Note that, unlike in the previous samples, relative intelligence differences in intelligence ratings were much more balanced in terms of which person was perceived as more intelligent. In fact, the mean relative difference between self-ratings and partner-ratings was -0.27 ($SD$ = 2.42), indicating that participants on average rated themselves as .27 scale points less intelligent than they rated their network partners. Indeed, no less than 67% of all participants regarded their interaction partner as equally or more intelligent as themselves.

To investigate the effect of perceived intelligence differences more fully, three different indices were created. First, an index of *self-concept similarity* was calculated by taking the absolute difference of both participants' self-ratings of intelligence. Second, an index of *target agreement*, operationalized as the absolute difference between participants' self-rating and the rating provided by their partners, was calculated. Third, an index of *perceived similarity* was calculated by taking the difference between individuals' ratings of their own intelligence and their partners' intelligence.

Table 16 contains correlations between MU (composite of participants' ratings and behavioral observations) and between-person differences in intelligence/dispositional valuations. As can be seen, only one dyadic effect was marginally significant: The level of disagreement regarding the first interviewer was negatively correlated with the amount of MU. Thus, conversations between participants with very divergent opinions about the intelligence of the first interviewer were less understanding than conversations in which there was a large degree of agreement on this issue. The level of agreement regarding the second interviewer was not associated with MU.

Apart from the effect of intersubjective agreement regarding the first interviewer's intelligence level, no other dyadic effects were significant. Between-person differences in psychometric intelligence tests and self-reported openness were unrelated to the level of MU. Also, profile similarity regarding the psychometric intelligence measures (i.e., numerical and figural intelligence, and vocabulary), the Big Five factors (excluding

[41] Using the formula $d_{ij} = \left[\sum_{a=1}^{m}\left(x_{ia} - x_{ja}\right)^2\right]^{1/2}$ where $d_{ij}$ is the Euclidean distance between persons $i$ and $j$, $m$ represents the number of personality dimensions, and $x_{ia}$ and $x_{ja}$ are the scores on personality variable a for person $i$ and $j$, respectively.

openness), the AIST interests scales, and the Rokeach value rankings was not significantly related to MU. Accordingly, the emergent effect hypotheses did not receive much support.

Table 16

*Correlations Between MU and Between-Person Differences in Intelligence and Dispositional Valuations in Sample 4*

| | Impact of absolute difference | | |
|---|---|---|---|
| | MU | MU(1) | MU(2) |
| *Difference scores* | | | |
| Intelligence ratings | | | |
| -Self-concept similarity [a] | -.06 | -.05 | -.06 |
| -Target agreement (Interviewer 1) [a] | -.22† | -.17 | -.23† |
| -Target agreement (Interviewer 2) [a] | -.06 | .04 | -.15 |
| -Perceived similarity (Interviewer 1) [a] | -.05 | -.05 | -.04 |
| -Perceived similarity (Interviewer 2) [a] | .07 | .08 | .04 |
| Intelligence tests | | | |
| -Numerical IQ | .00 | -.06 | .05 |
| -Figural IQ | -.09 | -.01 | -.16 |
| -Vocabulary | -.01 | -.03 | .02 |
| Openness | .04 | -.08 | .14 |
| *Profile similarity* | | | |
| - Intelligence + vocabulary | -.04 | -.06 | -.01 |
| - FFM (excl. Openness) | .10 | .09 | .09 |
| - Values | -.12 | -.07 | -.14 |
| - Interests | -.10 | -.11 | -.07 |

[a] More positive values are indicative of *less* similarity

*Note*. MU = Composite measure of self-reported and observed mutual understanding (interaction half in brackets), FFM = Factors of the Five-Factor Model of personality description. $N$ = 68-72.

** $p$ = .01, * $p$ = .05, † $p$ = .10

## 4.4 Group Differences

In the previous Sections 4.2 and 4.3, main and dyadic effects of intelligence and dispositional valuation were discussed. In the following section, it is tested what effect the combined impact of these factors has in a sample that is extreme with regard to one important cognitive personality trait: intelligence. Specifically, it was tested to what degree intellectually gifted individuals, highly achieving university alumni, and averagely achieving alumni in Samples 1-2 differ from each other in terms of a number of (indirect) indicators of adjustment and MU: Neuroticism, general self-esteem, self-esteem of relationships with people of the same and opposite gender, self-esteem of relationships with parents, loneliness, and social network size. Because MU is hypothesized to be an important first step in the establishment of intimate relationships, these comparisons indirectly address the following hypothesis:

> Extreme group hypothesis: Intellectually gifted individuals experience a lower level of MU in their social relationships

### 4.4.1 Differences in Self-report Scales

Multivariate analyses of variance (MANOVA) were carried out with sample membership (Mensa member, highly achieving alumni, and averagely achieving alumni) as between-subjects factor and the above described adjustment and MU indicators as dependent variables. Except for neuroticism, significant group differences were found for all variables (see Table 17 and Figure *6*), multivariate $F(6, 431) = 27.82$, $p < .01$. Planned contrasts showed that this was due to differences between Mensa members and alumni ($p$s $\leq .01$ for all variables except neuroticism). In contrast, differences between highly and averagely achieving university alumni were not significant except for self-esteem of opposite-sex relationships, with somewhat higher values for the high achievers ($p = .02$).

Table 17

*Differences Between Mensa Members and University Alumni in Self-Reported Social Adjustment*

| Dependent variable | Sample | Mean | *SD* | *F* [a] | *d* [b] |
|---|---|---|---|---|---|
| Neuroticism | Mensa members | 2.65 | 0.84 | 2.01 | 0.15 |
| | High achievers | 2.50 | 0.64 | | |
| | Average achievers | 2.57 | 0.61 | | |
| General self-esteem | Mensa members | 3.72 | 1.03 | 5.88** | -0.30 |
| | High achievers | 4.03 | 0.76 | | |
| | Average achievers | 3.96 | 0.73 | | |
| Opposite-sex self-esteem | Mensa members | 3.50 | 0.95 | 14.92** | -0.43 |
| | High achievers | 4.00 | 0.74 | | |
| | Average achievers | 3.74 | 0.83 | | |
| Same-sex self-esteem | Mensa members | 3.23 | 0.86 | 46.19** | -0.90 |
| | High achievers | 3.95 | 0.70 | | |
| | Average achievers | 3.93 | 0.72 | | |
| Parents self-esteem | Mensa members | 3.26 | 1.00 | 31.31** | -0.72 |
| | High achievers | 4.00 | 0.85 | | |
| | Average achievers | 3.88 | 0.92 | | |
| Loneliness | Mensa members | 2.30 | 0.70 | 49.37** | 0.92 |
| | High achievers | 1.73 | 0.44 | | |
| | Average achievers | 1.79 | 0.42 | | |
| Size of social network | Mensa members | 16.41 | 9.06 | 29.86** | -0.71 |
| | High achievers | 22.91 | 8.39 | | |
| | Average achievers | 22.29 | 8.51 | | |

*Note*. Because of the lack of significant differences between high achievers and average achievers, these groups were pooled together in the comparisons with the Mensa members.

[a] Based on the difference between Mensa members and university alumni

[b] Calculated with Cohen's formula $d = (M_1 - M_2) / SD_p$, where $M_1$ is the mean for the Mensa group, $M_2$ is the mean for the alumni, and $SD_p$ is the pooled *SD* across the entire sample

** $p < .01$, * $p < .05$

An inspection of the effect sizes of the difference between the Mensa members and university alumni[42] showed that the difference between both groups in terms of general and opposite-sex self-esteem were small to modest following Cohen's guidelines. However, the differences regarding self-esteem of the relationships with parents and same-sex peers, subjective feelings of loneliness, and total network size ranged between .70 and .90 and can be described as large (i.e., around .80).

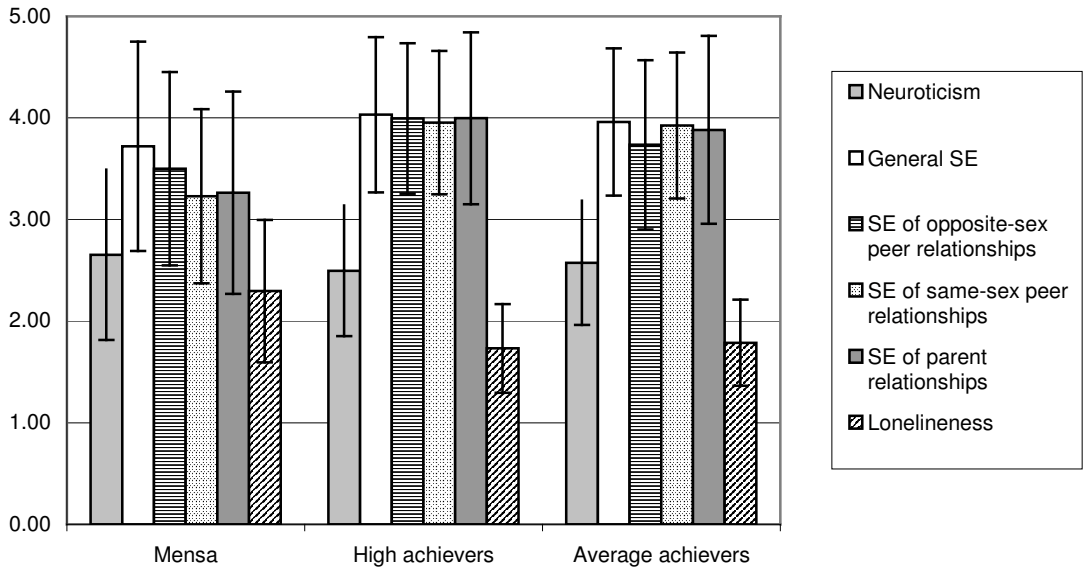



*Figure 6*. Mean Level Differences in Self-Rated Social Adjustment Between Intellectually Gifted Mensa Members, Highly Achieving University Alumni, and Averagely Achieving University Alumni.

Group comparisons between Mensa members and university alumni are somewhat biased because these groups differed in a number of respects. For example, Mensa members were older and less educated, which may have affected the comparisons. To correct for this potential bias, GLM analyses with participant age as a covariate and gender, sample, questionnaire format, and their interaction terms as a between-subjects factors were carried out.

[42] High and average achievers were pooled together because they did not significantly differ from each other in their level of social adjustment.

Findings showed that the multivariate effect of participant sample remained significant, $F(6, 401) = 4.55$, $p < .01$. Inspection of univariate follow-up tests showed that Mensa members no longer differed from the university alumni in terms of general self-esteem and total network size. However, the effects for the self-esteem of same-sex, opposite-sex and parental relationships, and loneliness remained significant ($ps \leq .03$). Accordingly, the lower social self-esteem and higher loneliness of the Mensa members was not a by-product of differences in gender, age, education or questionnaire format. This result is consistent with the Extreme Group Hypothesis.

Finally, an especially stringent test was created to compare Mensa members and highly achieving university alumni in terms of their social adjustment. This test included the average absolute difference between participants' and their network partners' rated intelligence as a control variable (in addition to the covariates listed above). The inclusion of this control variable provides an indication whether the differences in adjustment between Mensa members and university graduates are due to larger between-person differences in intelligence (as the Simonton model would predict) or to other, unknown factors (e.g., selection bias). Results of this stringent analysis replicated the lower level of social adjustment for Mensa members, multivariate $F(6, 318) = 3.25$, $p < .01$. In contrast, the multivariate effect of intelligence differences became only marginally significant after controlling for Mensa membership, $F(6, 318), = 1.90$, $p = .08$. This clearly speaks against the notion that the lower social adjustment of the Mensa members is due to between-person differences in intelligence.

### 4.4.2 Differences in Social Network Composition

As described above, group comparisons between Mensa members and university alumni uncovered significant differences in terms of their social self-esteem and feelings of loneliness. These differences were found in spite of the absence of sample differences in more generalized emotional tendencies such as Neuroticism and general self-esteem. Because MU theoretically is an important determinant of the quality of social relationships, the lower relationship quality observed for gifted individuals indirectly supports the hypothesis that they experience a lower level of MU in their social relationships.

To investigate whether this hypothesis is also confirmed by the ego-centered network data, a HLM analysis was carried out. As covariates , network size[43], age, gender, and education were inserted as covariates. To test whether there are group differences in the overall level of MU, a dummy variable indicating Mensa membership was inserted as a predictor of the relationship quality intercept and as a moderator of the effect of different relationship categories. This procedure allowed a fine grained analysis of the impact of Mensa membership on specific types of relationships. For example, a negative association between Mensa membership and the parent-dummy x relationship quality slope would indicate that Mensa members have less satisfying relationships with their parents. Because the importance of certain relationships may vary across different age groups (Carstensen, 1992), participant age was included as an additional predictor of the relationship category slopes.

Results of the analysis are shown in Table 18. As can be seen, Mensa members did not differ from the university alumni in terms of the average relationship intercept. Thus, the level of MU in relationships with „typical"[44] network partners did not differ between both groups. However, there were consistent moderator effects of Mensa membership on the impact of relationship category. First, across the entire sample, relationships with parents were rated as above-average in quality, but this effect was less strong for the Mensa members ($\Delta$ = -.44, $p < .01$). Second, an even stronger relative effect was found for other family members, with university alumni perceiving a larger increase in quality than the Mensa members ($\Delta$ = -.38, $p < .01$). Third, across the entire sample, relationships with romantic partners were rated as higher in quality (+ 1.86, $p = .01$), but less so for Mensa members ($\Delta$ = -.27, $p = .03$).

[43] Because only 19% of Mensa members vs. 74% of alumni used the Internet version of the questionnaire, the cell sizes for this comparison were relatively unbalanced. Because of this, the inclusion of both Mensa membership and questionnaire format would lead to colinearity among predictors ($r = .54$, $p = .01$) and bias the linear HLM analysis. Note, however, that the most important difference between both questionnaire formats seems to be the smaller number of contact persons in the Internet condition. Because the total size of the ego-centered network was included as a covariate in the HLM analysis, concerns about this possible source of bias can be somewhat assuaged.

[44] In this case, „typical" refers to a relationship with a person who does not belong to any of the dummy-coded categories (i.e., who is not a family member, friend or partner).

Table 18

*HLM Regression Coefficients of the Effect of Ratings of Network Partner Intelligence and Mensa Membership on Relationship Quality Across Different Relational Categories*

| | Level 1 (relationship-specific) | | | | | |
|---|---|---|---|---|---|---|
| | Intercept | IQ | Parent | Family | Partner | Friend |
| | -0.60** | 0.35** | 1.21** | 0.81** | 1.86** | 0.90** |
| *Level 2* | | | | | | |
| -Mensa | -0.09 | -0.01 | -0.44** | -0.38** | -0.27* | -0.12 |
| -Network size | -0.02 | | | | | |
| -Age | 0.00 | | -0.15* | 0.06 | -0.06 | 0.02 |
| -Female gender | 0.10** | | | | | |
| -Education | -0.04 | | | | | |

*Note*. IQ = intelligence rating, corrected for age and gender. All continuous variables were standardized before entering in the analysis. Level 1, $N$ = 7,808; Level 2, $N$ = 405. Mean random effects (across all four analyses) were estimated at .35, .20, and .74 for the Level 1 intercept, the IQ x relationship quality slope, and the residual variance, respectively ($p$s < .01).

** $p < .01$, * $p < .05$

### 4.4.3 Compensation Mechanisms

In light of the above-described social adjustment problems of Mensa members, it is interesting that (controlling for age and education) the current study did not find any differences between Mensa members and university alumni in terms of general self-esteem. This raises the possibility of a potential compensatory function of the Mensa membership. That is, it may be that gifted individuals who experience social adjustment problems somehow "compensate" this threat to their self-esteem by means of their higher self-concept of intelligence, of which the Mensa membership is the symbolic emblem.[45]

[45] Alternatively, it may be that the lower social self-concept of the Mensa members is a result of an intra-individual contrast effect resulting from their high self-concept of intelligence (Marsh, 1986). Note, however, that the highly achieving university alumni can also be expected to have a high self-concept of

If the above interpretation is correct, then the Mensa members should have a lower social-concept, a higher intellectual self-concept, and an equally high general self-concept when compared to the university alumni. To test this notion, a GLM analysis with participant age and education as a covariate and Mensa-membership, gender, sample, questionnaire format, and their interaction terms as between-subjects factors were carried out (i.e., equivalent to the procedure described in Section 4.4.1). As dependent variables, the self-concept scale of intelligence and the mean of the self-concept with relationships with parents, same-sex, and opposite-sex peers were used. Results indicated that Mensa members ($M$ = 3.33, $SD$ = .66) had a significantly lower social self-concept than the university alumni ($M$ = 3.95, $SD$ = .53), $F(1) = 19.33$, $p < .01$. By comparison, Mensa members ($M$ = 3.89, $SD$ = .68) had a higher intellectual self-concept than the alumni ($M$ = 3.28, $SD$ = .74), $F(1) = 35.10$, $p < .01$.[46] Because the group comparison reported above showed no differences in general self-esteem, the above results are consistent with the compensation hypothesis.

In sum, comparisons between Mensa members and university alumni resulted in a number of clearly delineated social differences. After controlling for age, gender, and education, Mensa members had lower self-esteem of relationships with peers of the same and opposite sex, a lower self-esteem of the relationship with parents, and a higher self-perceived loneliness. In terms of relationships with specific partners, these self-views were corroborated for relationships with family members and partners. Note that the differences in social adjustment were found despite a lack of effects for more generalized constructs such as Neuroticism or general self-esteem. In addition, Mensa members did not differ from university alumni in terms of their relationships with friends, colleagues, neighbors, and co-workers, so the differences found for family members and partners were not due to generalized response tendencies in completing the social network questionnaire. Because

---

intelligence, yet their social self-concepts are significantly more positive when compared to the norm data reported by Schwanzer (2002; $z$-scores = .18 and .50 for the self-concept of peers of the same and opposite sex, respectively, $p$s < .01).

[46] Note that results did not change when the Mensa members were compared to the subgroup of highly achieving alumni ($M$ = 3.34, $SD$ = .78), $F(1) = 23.04$, $p < .01$

of these consistent social adjustment differences to the disadvantage of the Mensa members, the Extreme Group Hypothesis received strong support.

# 5 Chapter 5: Discussion

The following chapter discusses the results and implications of the current study. First, Section 5.1 discusses how the current findings relate to theoretical conceptions regarding the measurement and process of mutual understanding. After this, Sections 5.2 and 5.3 review the outcomes of the main and dyadic effect hypotheses, respectively, and how the findings from the current study relate to the theoretical framework discussed in Chapter 2. Section 5.4 discusses the combined influence of main and dyadic effects in intellectually gifted individuals. After this, limitations of the current dissertation are reviewed in Section 5.5, followed by an overview of strengths in Section 5.6. Finally, general conclusions and recommendations for future research are discussed in Section 5.7.

## 5.1 The Process of Mutual Understanding

As stated in Chapter 1, MU has not received much attention in psychological research. In social relationship science, a number of related constructs such as empathy, social support, rapport, and intimacy exist. In addition, communication research has identified a number of mechanisms that facilitate the process of MU, such as audience design, perspective taking, and reference to shared experiences. In the following, the present dissertation's findings regarding the MU process are reviewed critically. A more thorough understanding of the mechanisms behind this process will serve as a background for the subsequent discussion of the findings regarding main and emergent effects in Sections 5.2 and 5.3.

### 5.1.1 Discriminant Validity of MU

In the introduction, it was contented that MU can be an important first step in the establishment of social support, rapport, and intimacy. However, it was also argued that MU can occur without being followed by social support and feelings of relational harmony, especially in the early stages of relationship formation. Sample 4 provides a good opportunity to test this notion, because it involved two previously unacquainted persons interacting with each other. Although it is not unlikely that these persons would develop a deep sense of understanding of each other's life domains, it is less probable that

they would experience a deep emotional connection to each other during such a limited time.

Results partially supported the relative independence of MU and emotional closeness. For example, a factor analysis of the post-interaction questionnaire showed that items related to interviewers' perceived understanding of the interaction partner (i.e., comprehending what is said, providing enough room to explain things) load on a different factor than items that tap into more emotional, rapport-like aspects of communication (i.e., feeling relaxed, experiencing a smooth conversation). This replicates a finding by Emmers-Sommer (2004), who found two factors after factor-analyzing experience sampling reports of social interactions: a Depth factor describing personal and in-depth relationships, and a Smoothness factor describing a relaxed communication free of conflict and breakdowns.

In contrast to the interactions between strangers, evaluations of more established relationships in Samples 1, 2, and 3 showed a lower level of differentiation. When participants assessed their network partners with the help of an ego-centered social relationship instrument, items tapping successful communication and understanding (which are most closely related to MU) loaded on the same general factor as more generalized assessments of closeness, importance, support, and acceptance. From these findings, it may seem that people do not differentiate between MU and broader measures of relationship quality. Note, however, that the high degree of association between these different indicators is exactly what would be predicted by the theoretical framework outlined in Chapter 1. That is, because MU was hypothesized to be a first prerequisite for the establishment of intimacy, MU and more emotional aspects of relationship quality should become increasingly correlated as relationships develop.

### 5.1.2 Convergent Validity of MU Assessments Across Information Sources

One of the potential critiques of the MU construct is that the phenomenon is too subjective to be of much use as a variable in nomothetic research. If MU is so idiosyncratic that it lacks an "objective" foundation, it may be impossible to test an individual's claim that he or she is not properly understood. Because Studies 1.II and 4 involved multiple information sources for the level of MU, it is possible to assess the convergent validity of the current operationalizations. The present results indicated a moderate level of agreement. In the first half of the conversation in Study 4, the correlation between

interviewer and interviewee reports of MU reached a level of .31, and in the second half, the correlation was .26 (*p*s = .05). Although this may seem somewhat low, it is comparable to the .37 correlation between self-ratings of rapport found by Bernieri et al. (1996). It is also comparable to the correlation of .23 ($p = .01$) between the dyadic partners' composite ratings of relationship quality in Sample 1.II.

In addition to the agreement between interviewer and interviewee, there was also a moderate level of agreement between participants' ratings and judgments based on behavioral observations. Specifically, across both interaction halves and interview roles, the average correlation between subjective ratings (understanding as interviewer and interviewee, separately for both interaction partners) and behavioral observations after *r*-to-*z* transformation and back-transformation was .30 (*p*s $\leq$ .10).[47] These levels are comparable to the agreement level of .24 (single coders) and .30 (pooled across $N = 45$-52 coders) reported by Bernieri et al. (1996). Together, the current results imply that MU is an intersubjective phenomenon that can be reliably inferred from the behavioral stream, though the moderate size of the convergent correlations points to idiosyncratic influences as well.

### 5.1.3 Chronological Correlates of MU

According to Clark (1992), the initial phase of a conversation is used to establish a „common ground" of shared interpretational knowledge. After this common ground has been set up, it should become easier to understand the utterances of the other person, and the level of MU should go up. Because establishing common ground requires time, MU should be positively related to interaction duration, at least up to a certain point. This expectation could be tested in Sample 4. Specifically, interaction duration was operationalized both as interaction half (as the participants were already somewhat familiar with each other in the second interaction half) and the number of 30-second intervals that had elapsed since the beginning of the interaction. Because of the hierarchical nature of the data, this analysis was carried out with HLM. Results indicated a significant effect of both

[47] It could be objected that this level of agreement was partially inflated because the four most extreme self-ratings were used to „anchor" the behavioral observations. However, excluding these cases still produced an average agreement of .21, which is significant, $t(64) = 1.72$, $p = 0.05$.

interaction half ($b$ = .34) and time elapsed ($b$ = .14; both $p$s = .01)[48], whereas the interaction term was not significant ($p$ = .35). This is consistent with the interpretation that as participants in Sample 4 had more time to establish a common ground, they also became better at understanding each other's utterances.

One of the strongest associations over time found in the current study was the correlation between MU measured across interaction halves. Specifically, the aggregate behavioral judgment correlated .74 across the two halves, and felt understanding as interviewer and interviewee correlated .66 for the person that started the interaction as interviewee ($p$s = .01). Thus, more than 40% of the variance of MU in the second half of the conversation could be explained by the level of MU in the first half of the conversation. Apparently, participants established a sense of MU that transcended the specific interaction half or interaction role they were involved in. This provides strong evidence that MU is a truly emergent phenomenon.

Somewhat in contrast, the ratings of the person that started the conversation as interviewer were „only" correlated .27 ($p$ = .05). The difference between these correlations was significant, $z$ = 2.75, $p$ = .01. Apparently, first interviewers had a more differentiated view of the unfolding interaction, whereas first interviewees transferred their impressions of the first interaction half to the second half. As described in Section 4.1.2, this is probably due to the fact that the first interviewer could discriminate between his own (covert) subjective understanding and (overt) communicative behavior, whereas the first interviewee could not. This probably made the judgments of the former person less susceptible to the influence of generalized positivity biases that may have contributed to the high timely stability of the impressions of the second interviewer. This suggests that the participants' „starting position" shaped their perceptions of the interaction process as the conversation unfolded (this point is further discussed in Section 5.7.2).

[48] When the interaction half was ignored and the number of 30-seconds intervals was counted from the beginning of the first to the end of the second interaction half, the beta coefficient specifying the association between time elapsed and MU increased to .23 ($p$ = .01).

## 5.2 Discussion of Main effects

After discussing the current dissertation's findings regarding the measurement and process of mutual understanding, the following section reviews the outcomes of the three main effect hypotheses and their implications for the theoretical framework outlined in Chapter 2. Main Effect Hypothesis 1 predicted that fluid intelligence should be related to higher levels of MU. Main Effect Hypothesis 2 predicted that vocabulary is positively related to MU. Finally, Main Effect Hypothesis 3 predicted that openness to experience is positively related to MU. Table 19 shows the results of the tests of the main effect hypotheses, grouped by variable, sample, and assessment method. In the following sections, results for each of these hypotheses are discussed in more detail.

### 5.2.1 Main Effects of Fluid Intelligence on MU

According to the theoretical background depicted in Chapter 2, fluid intelligence facilitates the use and interpretation of contextual cues in encoding the meaning of verbal messages and a fluent encoding of ideas. Accordingly, Main Effect Hypothesis 1 predicted that fluid intelligence is positively associated with the level of MU. As can be seen in Table 19, this hypothesis was generally confirmed when participants rated both their network partners' intelligence and the quality of the corresponding relationship. The only exception was Sample 4, where partner-ratings of intelligence were only related to MU when the first interviewer was the target, not the second interviewer. Overall, consistent evidence for a perceived (within-person) association between ratings of partner intelligence and relationship quality was found.

As can be seen in Table 19, however, the picture for Main Effect Hypothesis 1 was quite different when assessment methods other than partner-ratings were used. In Samples 1 and 2, intelligence self-ratings were negatively associated with the overall MU level when the single item rating scale was used, whereas the intelligence self-concept scale did not produce any significant effects. In addition, psychometrically assessed fluid intelligence in Sample 4 was not significantly associated with MU. Accordingly, Main Effect Hypothesis 1 was not supported when intelligence self-ratings or IQ test results were used.

Table 19

*Summary of Results Across Main Effect Hypotheses*

| Sample | Variable | Assess-ment | Effect of Va-riable on MU | Hypo-thesis | Support for Hypothesis |
|---|---|---|---|---|---|
| 1 +2 | Fluid intelligence | PR | Positive | Hm-1 | Yes |
| 1.II | Fluid intelligence | PR | Positive/none | Hm-1 | Mixed |
| 3 | Fluid intelligence | PR | Positive | Hm-1 | Yes |
| 4 | Fluid intelligence | PR | Positive/none | Hm-1 | Mixed |
| 1+2 | Fluid intelligence | SR | Negative/none | Hm-1 | No |
| 4 | Fluid intelligence | SR | None | Hm-1 | No |
| 4 | Fluid intelligence | TEST | None | Hm-1 | No |
| 3 | Crystallized intelligence | TEST | None | Hm-2 | No |
| 4 | Crystallized intelligence | TEST | Positive/none | Hm-2 | Mixed |
| 1+2 | Openness | SR | None | Hm-3 | No |
| 3 | Openness | SR | None | Hm-3 | No |
| 4 | Openness | SR | None | Hm-3 | No |

*Note*. PR = Partner-ratings, SR = self-ratings, TEST = psychometric test, Hm = Main Effect Hypothesis

#### 5.2.1.1 Lack of Psychometric and Self-Report Effects

The lack of association between psychometric assessments and self-reports of intelligence and MU seems to contradict previous accounts that intelligence is an important factor in social understanding (Davis & Kraus, 1997; Guilford, 1967). Because fluid intelligence is defined as the ability to solve novel problems, most studies have used artificial problem situations to test the impact of intelligence on social skills. However, social interactions in everyday situations may not involve a great deal of reasoning about novel stimuli. For example, Kellermann and colleagues (Kellermann & Lim, 1990; Kellermann & Palomares, 2004) have repeatedly argued for the existence of schema-like routines that guide the choosing of topics in getting-acquainted conversations. Indeed, according to Kellermann and Lim (1990, p. 1178), conversation is “a relatively simple structure composed of a limited number of scenes, organized into a limited number of subsets, progressed through in a normative manner [...]”Such a pre-structured process may not require much elaborate cognitive processing facilitated by fluid intelligence (see

Section 5.7.4.4 for a discussion of alternative situational properties that may produce an association between intelligence and MU).

#### 5.2.1.2 Presence of Perceived Effects

In contrast to the lack of effects for self-reported and psychometrically assessed fluid intelligence, a consistently positive effect was found for ratings of partner intelligence. When individuals in Studies 1-3 rated their partners as more intelligent, they also perceived the quality of the corresponding relationship as closer and more understanding. In addition, if the first interviewer in Sample 4 was seen by his or her interview partner as more intelligent, the amount of MU (assessed by self-reports, partner-reports, and behavioral observations) was significantly higher. As reviewed above, however, no evidence for an association between MU and psychometric and self-rated intelligence was found. This creates the need to explain the positive association between ratings of partner intelligence and MU. What led participants to perceive a relation between MU and their interaction partner's intelligence level?

The most likely interpretation for this finding is the presence of a halo effect. That is, because intelligence and MU and other indices of relational quality are highly positive valenced, participants may confuse a favorable impression on one dimension with favorable impressions on the other. Indeed, previous research has provided evidence that intelligence ratings are confounded with feelings of interpersonal liking (Paulhus & Landolt, 2000). This may be due to the fact that people attribute a higher level of intelligence to sympathetic others or perceive intelligent others as more likeable.

Whereas intelligence and relationship quality were positively associated in Samples 1.I, 2, 3, and 4, in Sample 1.II such an association was found only when Mensa members provided both ratings. In contrast, when a network partner provided the ratings of *either* intelligence *or* relationship quality, no effect was found. Probably, this difference is due to a method artifact. Recall that Mensa members rated the intelligence and relationship quality for all contact persons, whereas contact persons rated only one person: the Mensa member. It may be that the availability of multiple rating targets made it easier for the Mensa members to differentiate between network partners and thus enhanced validity of both intelligence and relationship quality ratings.

The interpretation that the null results for the Mensa members' network partners is due to psychometric problems is backed up by the fact that the network partners provided

higher and more restricted ratings of relationship quality than the Mensa members ($M$ = 4.17, $SD$ = . 30 and $M$ = 3.98, $SD$ = . 55, respectively). The differences between the means and standard deviations of the two groups were statistically significant, $t(173) = 4.30$, $p <$ .01 for the means, and $F(173, 173) = 1.89$, $p < .01$, for the $SD$s. Thus, the lack of association between intelligence ratings and relationship quality for network partners can partly be attributed to a ceiling effect and range restriction in network partners' ratings of relationship quality.

## 5.2.2 Main Effects of Crystallized Intelligence on MU

Main Effect Hypothesis 2 predicted that vocabulary size, a facet of crystallized intelligence, is positively associated with MU. This hypothesis was not supported in Sample 3 and partially supported in Sample 4 (see Table 19). In the latter sample, conversations in which the first interviewer had a larger vocabulary were rated as higher in MU. In the following section, the theoretical implications of this positive association are discussed (possible reasons for the lack of effects in the case of Sample 3 and the second interviewer in Sample 4 are explored in Section 5.7.2).

### 5.2.2.1 Positive Effect of Crystallized Intelligence

As stated above, the fact that the first interviewer's crystallized intelligence had a positive effect on MU in Sample 4 is consistent with Main Effect Hypothesis 3. According to the theory described in Section 2.2.2, having a larger vocabulary should be positively associated with both encoding and decoding ability. On the encoding level, research has found that having a large number of cognitive constructs is associated with higher communication effectiveness (O'Keefe & Sypher, 1981). On the encoding side, it is well-established that vocabulary knowledge is a crucial first step in verbal comprehension (Cain, Oakhill, & Lemmon, 2004). Because both encoding and decoding effectiveness should lead to higher levels of MU, the current results point to the important role of crystallized intelligence in verbal communication.

Results from Study 4 are consistent with the dual function of crystallized intelligence in facilitating both encoding and decoding processes. That is, when the first interviewer had a larger vocabulary, his or her *interview partner* not only reported a higher level of felt understanding as interviewee ($r$ = .30, $p$ = .01), but also as interviewer in the second interaction half ($r$ = .26, $p$ = .03). Of course, it is possible that both correlations

merely reflect a generalized sense of satisfaction with the conversation, regardless of the conversation half and the ordering of interviewer positions. Indeed, recall that the correlation between the second interviewer's felt understanding as interviewer and interviewee was .66, which was highly significant ($p < .01$). This strong association was not mediated by the first interviewer's vocabulary level, as controlling for this factor did not affect the correlation (partial $r = .64$, $p < .01$). Accordingly, it seems possible that the second interviewer's higher sense of MU was already firmly established in the first half of the interaction as a result of the superior interviewing skills of the first interviewer and not further enhanced by the latter's superior encoding skills when acting as interviewee.

In the current dissertation, no association was found between psychometrically assessed fluid intelligence and MU, whereas there was a significant relation between the first interviewer's crystallized intelligence and MU in Sample 4. It should be noted that previous research has mostly ignored this distinction when reporting associations between mental ability and social skills (e.g., Davis & Kraus, 1997). In spite of strong empirical associations between fluid and crystallized intelligence (Carroll, 1993), there exist plausible reasons why they may be differentially associated with the ability to understand the utterances of other people. A link to theories regarding the decoding of nonverbal displays can be helpful here. An important concept in this field are so-called nonverbal decoding rules, which are defined by Buck (1983, p. 217) as "cultural rules or expectations about the attention to, and interpretation of, nonverbal displays". As cultural rules seem at least as important in the decoding of verbal messages (in terms of language, conventional expressions, etc.), such "crystallized" decoding rules may be more important in verbal communication than "fluid" reasoning about the meaning of novel communicative utterances.

Scattered empirical evidence is consistent with the notion that skills that facilitate interpersonal understanding are more dependent on crystallized intelligence than on fluid intelligence. For example, MacCann, Roberts, Matthews, and Zeidner (2004) reported that a performance measure of emotional intelligence is correlated with crystallized but not with fluid intelligence (also see Ciarrochi, Chan, and Caputi, 2000). Davis and Kraus (1997) reported an average correlation of .23 between observed empathic accuracy and „intellectual functioning" (a category not further specified but probably including both crystallized and fluid intelligence). By comparison, a slightly higher average correlation of .27 was reported between empathy and "cognitive complexity", a construct usually

operationalized as the number of verbal dimensions used to describe stimuli and thus akin to crystallized intelligence. Because this evidence is highly indirect, however, more studies are needed to address the hypothesis that crystallized and fluid intelligence are differentially related to MU.

### 5.2.3 Main Effects of Openness to Experience on MU

According to Main Effect Hypothesis 4, openness to experience should be positively associated with MU because open individuals are better able to cope with the unstructured, ambiguous process of tailoring their messages to the knowledge background of their interaction partners. Results across all samples overwhelmingly disconfirmed this hypothesis: In no case was openness to experience significantly associated with the level of MU, regardless of the instrument used to measure openness (BFI vs. NEO-FFI), the type of social relationships that were assessed (strangers vs. well-established social relationships), or the sample that was used (Mensa members vs. university alumni/students). In the following, an explanation for this lack of association is offered.

#### 5.2.3.1 Explanation for Inconsistency with Previous Literature

One of the empirical foundations of Main Effect Hypothesis 4 was a study by Richter and Kruglanski (1999), who reported that descriptions of abstract figures by more open participants are more likely to be recognized by "naïve" individuals. Specifically, their descriptions are more detailed and contain less idiosyncratic references, presumably making them easier for others to understand. These results provide indirect evidence that open people are more effective actors in the process of audience design. In contrast, the current dissertation found no significant main effects of openness on MU. What may have caused this discrepancy?

The most likely explanation seems to lie in differences in experimental setting between the two studies. Specifically, participants in Richter and Kruglanski's (1999) experiment only read other people's written descriptions and thus did not interact directly with each other. This made it impossible for them to rely on dynamic discourse cues, such as back-tracking responses, facial feedback (e.g., a puzzling look), and clarification questions. Such a task likely makes the audience design process a lot tougher, but it may not necessarily be representative of more everyday-like conversations. Also, the focus on abstract figures in their study may have been quite untypical of naturalistic conversations.

As described above, everyday conversations may not be directed so much on novel, complex topics but instead proceed in a fairly predictable manner (Kellermann & Lim, 1990). As indicated by the results of the present dissertation, the ability of open individuals to tolerate ambiguity may therefore not be such a crucial asset in more everyday interactions.

## 5.3 Discussion of Dyadic Effects

Moving from the level of individuals to the level of dyads, one of the overarching hypotheses of the current study was that between-person differences in intelligence and dispositional valuations limit the degree of overlap in life experiences and the meaning attached to these experiences. Accordingly, dyadic personality differences should be negatively associated with the level of MU. Specifically, it was predicted that differences in fluid and crystallized intelligence, openness to experience, and values would be related to decreases in MU. In the following section, the results regarding these hypotheses are summarized and discussed.

### 5.3.1 Status of Dyadic Effect Hypotheses

#### 5.3.1.1 Dyadic Effects of Fluid Intelligence on MU

Table 20 summarizes the results of the tests of the dyadic effect hypotheses. As can be seen, results were generally not supportive of Dyadic Effect Hypothesis 1. In line with predictions, (absolute) rated intelligence differences in Sample 2 were negatively associated with relationship quality. However, additional analyses showed that this effect was solely due to the fact that participants regarded relationships with people they judged to be *less* intelligent as lower in quality; a similar deleterious effect for relationships with *more* intelligent partners was not found. In addition, negative dyadic effects of perceived intelligence differences in Sample 4 were neither found for rated intelligence nor for psychometric intelligence.

Table 20

*Summary of Results Across Dyadic Effect Hypotheses*

| Sample | Between-person difference | Assess-ment | Effect of difference on MU | Hypo-thesis | Support for hypothesis |
|---|---|---|---|---|---|
| 2 | Fluid intelligence | SR | (Negative) [a] | Hd-1 | Mixed |
| 4 | Fluid intelligence | SR | None | Hd-1 | No |
| 4 | Fluid intelligence | TEST | None | Hd-1 | No |
| 4 | Crystallized intelligence | TEST | None | Hd-2 | No |
| 1.II | Openness | SR | None | Hd-3 | No |
| 4 | Interests | SR | None | Hd-4 | No |
| 4 | Values | SR | None | Hd-4 | No |

*Note*. PR = partner-ratings, TEST = psychometric test, SR = self-ratings

[a] Relationships with more intelligence partners were not rated as lower in quality

#### 5.3.1.2 Dyadic Effects of Crystallized Intelligence on MU

According to the theory outlined in Section 1.2, people face difficulties in if they want to communicate words or facts that are not shared by their interaction partners. Accordingly, Dyadic Effect Hypothesis 2 predicted that interpersonal differences in crystallized intelligence are associated with decrements in the level of MU. This hypothesis was tested in Sample 4, which included an assessment of the knowledge level of participants involved in a dyadic interaction. However, no effect of absolute knowledge differences was found, which is inconsistent with Dyadic Effect Hypothesis 2.

#### 5.3.1.3 Dyadic Effects Openness to Experience on MU

According to Dyadic Effect Hypothesis 3, open and closed individuals have highly different "thinking cultures", which should produce a negative association between between-person differences in openness and their level of MU. However, in Samples 1.II and 4, where this hypothesis was tested, no negative dyadic effects of openness were found. Accordingly, Dyadic Effect Hypothesis 3 was not confirmed.

#### 5.3.1.4 Dyadic Effects Interests and Values on MU

Finally, Dyadic Effect Hypothesis 4 predicted there would be a negative association between interpersonal differences in interests and values on the one hand, and MU on the

other. This hypothesis was tested by correlating the Euclidean distance between interaction partners' interests and values profiles with their level of MU. Inconsistent with Dyadic Effect Hypothesis 4, however, between-person differences in interests or values were not associated with decreases in MU.

### 5.3.2 Implications of the Lack of Dyadic Effects

As becomes clear from the above overview, the basic assumption behind the dyadic effect hypotheses was not confirmed in the current study. Of course, there are several alternative explanations for the lack of univariate results, such as methodological weaknesses that limit the generalizability of the current findings (see Section 5.5). Together, however, the pattern of null results suggests that, in contrast to the theory cited in the second chapter, people are actually able to bridge personality differences in their mutual communication. In the following sections, the implications of this conclusion are discussed in more detail.

#### 5.3.2.1 Bridging Personality Differences

As stated above, participants in the current study were able to bridge between-person differences in personality in establishing mutually understanding relationships. According to Byrne's (1971) similarity paradigm, people have an active preference for interactions with like-minded others. The fact that the current study found similarity in intelligence, openness to experience, interests, and interests/values to be unimportant in shaping MU appears to contradict this notion.

In interpreting the discrepancy between the current results and the similarity paradigm, it should be noted that the similarity paradigm has relied almost exclusively on evidence from the so-called bogus-stranger method. In this method, people are given a fake personality profile that either resembles their own personality profile or is very much different. Results from these studies have overwhelmingly shown that people are more attracted to others with similar personality profiles (Byrne, 1997; Sunnafrank, 1992).

Although the experimental results obtained with the bogus-stranger method belong to the classical canon of social psychology, their implications for more everyday

interactions can be questioned. In a series of well-designed though ill-recognized[49] studies, Sunnafrank (1983; 1984; 1992) showed that this effect is only present when people are not allowed to communicate with the unknown person (which is always the case when this is a bogus person). When participants engage in a brief getting-acquainted interaction after being exposed to each other's personality profiles, similarity no longer exerts an effect.

According to Sunnafrank (1992), the failure to replicate results found with the bogus-stranger method in real-life communication settings is due to its artificial character. That is, each person is assumed to strive for a stable, predictable, and controllable environment. This goal is hypothesized to be threatened when people are to discuss controversial topics with a person *they have not met before* (i.e., the bogus stranger). For example, imagine a pro-life person who is told he or she is about to meet an unknown pro-choice person. This makes the activation of stereotypes about people of "the other side" more likely (e.g., "a leftist hippy"). In addition, the question may come up whether such a stranger will respect the opinion of the participant. When two persons with very different opinions actually meet, however, these questions are typically resolved rather quickly. After all, except for a few radical persons, most people are able to remain respectful and polite when discussing controversial topics with others.

Of course, some situations are less supporting of such a friendly, polite conversation where every person gets to have its say. In competitive, task-oriented situations, a different interpersonal dynamic may exist. In his 1985 article on intelligence and group influence, Simonton himself acknowledged the possibility that dyadic intelligence differences may only be related to interpersonal understanding in situations where a group needs to find a novel solution to a problem. Such a situation may be typical of many domains (e.g., politics, science). However, communication in emotion-focused groups may be much less affected by this limit on complexity. Thus, the current results do not contradict the Simonton (1985) model but rather questions its applicability to everyday social interactions between acquaintances and strangers.

[49] A quick search of the PsycINFO database uncovered that Sunnafrank's series of 7 empirical articles and book chapters on this topic are only cited 10 times by other authors.

## 5.4 Differences Between Gifted and Comparison Individuals

A corollary of the hypothesis that dyadic intelligence differences impair MU is that people who are extremely intelligent should face difficulties in their communication with others. To test this notion, university alumni and intellectually gifted members of Mensa were compared in terms of their level of social adjustment. Because university alumni are also above-average in intelligence, this comparison provided a stringent test of the existence of adjustment problems for gifted individuals. In line with the Extreme Group Hypothesis, Mensa members reported less satisfying and understanding social relationships. In contrast, no differences were found in terms of more generalized adjustment features, such as general self-esteem and neuroticism. These social differences of the Mensa members were limited to specific relationship categories, most importantly family members and partners. Accordingly, generalized response tendencies cannot be invoked to explain away the differences between the gifted and comparison sample.

According to the theoretical background of the current study, dyadic intelligence differences should be associated with communication decrements. This prediction was not confirmed in the current data. As such, the fact that Mensa members experience more social difficulties than a comparison group of university alumni represents a theoretical challenge. That is, in the current dissertation, only the predicted outcome (adjustment difficulties for gifted people), but not the predicted mechanism (communication difficulties between partners with very different intelligence levels) could be confirmed. Because of this, an alternative explanation for the differences between Mensa members and university alumni must be offered.

### 5.4.1 Self-Selection

The most likely explanation for the apparent social difficulties of the Mensa members is self-selection. That is, it is possible that gifted individuals who experience social problems are more likely to join Mensa. If this is true, Mensa members' social problems may not be representative of gifted individuals in general. Some evidence is consistent with this explanation. Recall that the only descriptive studies of gifted individuals that relied on unselected samples are those of Terman in the US (1925; Terman & Oden, 1959) and Rost (2000) in Germany. The gifted individuals in the Terman study were socially well-adjusted and did not report an elevated frequency of mental-health

problems. Somewhat in contrast, Rost's (2000) gifted individuals[50] had a somewhat more negative self-view of peer popularity and a lower frequency of meeting friends. Note, however, that this does not necessarily represent a subjective problem for gifted individuals. Indeed, his gifted children may have set other life priorities that led them to *voluntarily* invest more energy in non-social domains (e.g., by reading more books). Consistent with this argument, they did not have a lower self-concept of peer relationships.

Compared to the general lack of social problems reported for unselected gifted individuals, some studies examining members of Mensa have found evidence for adjustment difficulties. For example, Taft (1971) studied 244 Australian Mensa members. Consistent with the current finding that Mensa members report less satisfying relationships with family members, one third of his sample described their family life as unhappy, which according to the author is double the figure in comparison groups. Furthermore, Bögels, de Mey, and Derksen (1996) found that a substantial subgroup of Mensa members (22.6%) report a host of psychological problems as evidenced by their responses on the Minnesota Multiphasic Personality Inventory. Anecdotal evidence from the current study is consistent with this evidence. Specifically, one Mensa member emailed the current author to point out that many members discover their intellectual giftedness in psychotherapy. This may have led to an oversampling of individuals with social problems.

An empirical indication that the social problems of the Mensa members are caused by a sampling bias and not by their higher levels of intelligence per se can be obtained by comparing Mensa members with different levels of intelligence. If it is indeed the case that extremely high intelligence levels are associated with adjustment problems, then "extremely gifted" Mensa members should be worse off than "moderately gifted" members. As stated in Section 3.3.2.6, 76 Mensa members reported the result of the psychometric intelligence test they had used to become a member of Mensa. Within this subsample, 37 individuals were assigned to a „moderately gifted" group (IQ ≤ 135, mean IQ = 132.1, *SD* = 1.3), whereas the remaining 39 individuals were assigned to the „extremely gifted" group (IQ > 135, mean IQ = 138.9, *SD* = 3.7). This extreme group

[50] Note that Rost (2000) included both an intellectually gifted and a highly achieving sample. The highly achieving sample reported a lower self-concept of peer relationships compared to controls. Although the highly achieving sample also had above-average intelligence, however, they cannot be considered as gifted according to the conventional IQ > 130 criterion.

membership was used as a between-subjects variable in a subsequent ANOVA predicting neuroticism, social and general self-concept, and feelings of loneliness.

Results indicated no significant differences between the two giftedness levels (all *p*s ≥ .18). In addition, a supplementary HLM analysis of group differences in the parameters of the ego-centered network did not indicate any differences in the quality of relationships with parents, other family members, partners, or friends (*p*s > 0.26). Thus, no evidence was found that moderately and extremely gifted individuals differ in their level of social adaptation. These results are inconsistent with the notion that as people's intelligence level becomes progressively more extreme, it is more difficult for them to establish mutually understanding relationships with peers.

## 5.5 Limitations

A number of factors limit the generalizability of the conclusions of the current study. Specifically, these factors include the use of subjective assessments to operationalize MU, anomalies in the assessment of intelligence, the use of biased samples, and the correlational nature of the evidence. In the following, these limitations are discussed in more detail.

### 5.5.1 Subjective Assessment of MU

One of the possible limitations of the current dissertation is the use of subjective impressions to assess MU. In Studies 1-3, MU was assessed by asking participants to evaluate the degree to which they are able to communicate effectively with their network partners and felt understood by them. In Study 4, participants rated the degree to which they understood their interaction partners as well as the degree to which they themselves felt understood during the conversation. In addition, these self-ratings were supplemented by trained judges' ratings of MU. Yet even in the case of the behavioral observations, judgments were based on the degree of MU as indicated by these interviewee's reactions and the raters' own sense of what constitutes an appropriate interviewer reaction.

As stated previously, subjective ratings of interaction quality have been recommended by Bernieri and Rosenthal (1991) as being valid and cost-effective. Nevertheless, the emphasis on subjective impressions may come with some disadvantages when studying a concept like MU. That is, MU requires both partners to grasp the meaning

of each other's thoughts and feelings. In principle, this understanding is a covert, intra-psychic act. That is, it is possible that a person *understands* the meaning of his or her interaction partner's utterance without *expressing* this understanding. Equally possible, a person may overtly express understanding without really knowing what the other person is talking about. When the goal of the interaction is to achieve a smooth conversation, both interaction partners might be quite content with such a state of appearance and thus not bother to verify the expressed understanding. Accordingly, both persons may *feel* understood without "true" MU.

One indication that person's sense of reciprocal understanding may be only a proxy for "true" MU is the moderate convergent validity of the different MU indicators. Specifically, the correlation between different rating sources (first interviewer, second interviewer, behavioral observations) in Study 4 was only about .30. In addition, the correlation between the assessments of relationship quality of Mensa members and their network partners in Study 1.II was .23. Although these convergent validities were all statistically significant, they point to sizable idiosyncratic influences. For example, it may be that some people dispositionally feel more understood by their interaction partners than others (Sarason, Shearin, & Pierce, 1987). In addition, it may be that people are not able to differentiate the feeling of being understood from other intimacy-related feelings of validation and care (Reis, 1990). Finally, it may be that MU is asymmetric between interaction partners, in that an individual understands his or her interaction partner but this understanding is not reciprocated. In any case, such issues can only be addressed with the help of more objective assessment methods (see Section 5.7.4.2 for an example).

### 5.5.2 Reliability and Validity of Intelligence Assessment

In the current dissertation, a wide range of intelligence assessment procedures were used. In spite of this diversity, some of these procedures suffer from measurement problems. Most importantly, this concerns the intelligence ratings. As stated previously, intelligence self-ratings can be biased by self-serving tendencies (Paulhus Lysy, & Yik, 1998). This is especially worrisome when calculating indices that depend on the difference between intelligence self-ratings and partner-ratings. One indication that this difference score may have been biased is that fact that participants in Sample 2 rated only 4.3% of all

network partners as more intelligent than themselves. Of course, this is an extremely low value.

In evaluating these figures, two points need to be kept in mind. First, it may be that participants were actually correct in their impression that they have an above-average IQ (Taylor, Lerner, Sherman, Sage, & McDowell, 2003). After all, most of them were university alumni with high level of academic achievement and probably had above-average intelligence. Second, it may that the tendency to oneself as more intelligent than others is part of a pervasive phenomenon called the above-average effect (Kruger, 1999). Of course, if this tendency to judge one's own level of skills as higher than other people is universal across participants, it would have been possible to mathematically adjust self-ratings and partner-ratings according to a certain constant. However, as long as no psychometrical assessments of intelligence are available, the magnitude of self-enhancement processes cannot be determined.

Like self-ratings, partner-ratings of intelligence are also ridden with methodological problems. Most importantly, they are affected by stereotypes and halo effects. To statistically control the effect of stereotypes, the present dissertation partialed out age and gender effects from the intelligence ratings. However, it was not possible to control for the presence of halo effects. This is especially problematic as the current study used intelligence ratings to predict self-ratings of another highly positively valenced construct: relationship quality. As stated previously, it is not unlikely that the associations found between partner-ratings of intelligence and relationship quality are a result of a tendency to attribute positive qualities to well-liked people, a preference for people with positive attributes, or both.

A final problem regarding both intelligence self- and partner-ratings in the present study is the use of the single-item scale. First of all, the use of single items precludes the calculation of internal consistency needed for an empirical assessment of the degree of attenuation in the relation between intelligence ratings and MU. Second, the single-item scale turned out to be confounded by group membership in Sample 1. Specifically, Mensa members in this sample were explicitly aware of their maximum intelligence level and thus always rated themselves with the highest possible value of the scale (i.e., 20). By comparison, most university alumni probably did not know their IQ, so they may not have been so inclined to place very high bets on their own intelligence. This confounding of group membership and intelligence rating makes the interpretation of results more difficult

(e.g., as evidenced by the divergence of results based on the single-item scale compared to the intelligence self-concept scale[51]).

Although psychometric intelligence tests are not affected by the kinds of problems described above, the measures used in the current study might have suffered from some additional problems. For example, the figural intelligence test in Sample 4 had an alpha level of only .65, which is below the .70 that is considered acceptable. The other two intelligence tests had adequate reliabilities, but they were implemented online, which may have introduced additional sources of bias. Especially the vocabulary test may have been affected by this, since it requires participants to pick the correct word out of a list of five possibilities. It cannot be ruled out that internet users used search engines or online dictionaries to look up the correct word. Accordingly, it may be that the results of this test were not only affected by participants' vocabulary level, but also by motivational factors.

Finally, a further problem affecting the psychometric measures is the lack of significant correlations between the figural, numeric, and vocabulary tests. Thus, the current study could not replicate the general intelligence factor that is so well-established in psychometric research. Note, however, that the figural and vocabulary measures showed a clear restriction of range as evidenced by a *SD* almost half of the value reported for the norm population (see Table 4). In addition, it should be noted that Sample 4 evidenced a high degree of profile specialization with regard to intelligence, with more mathematically-oriented students having higher values in numerical intelligence and language-oriented students having larger vocabularies. Nevertheless, the failure to replicate a general intelligence factor gives rise to caution in interpreting the current results.

### 5.5.3 Sampling Bias

Another major limitation of the conclusions of the current study is the possibility of sampling bias. As stated above, the reliance on university students may have led to restrictions in range in intelligence in Study 4. In addition, selection bias may have been exacerbated even more by differences in the invitation letter sent to potential participants

[51] Note, however, that the single-item measure and the self-concept scale to rate intelligence were significantly correlated in the alumni sample, $r = .53$, $p < .01$. In samples that are not explicitly aware of their IQ, both measures would probably have produced equivalent results.

in Study 2. Specifically, it is possible that most participants who took part in the study did so because they felt they received an invitation because of their high intelligence level (see Section 3.1.3.2). Finally, a source of bias may also have resulted from indirect hints regarding the study's topic and hypotheses in the recruitment material. Specifically, descriptions of the project contained cues that the study was interested in the effect of personality similarity on social relationship quality. This may have led to an oversampling of participants with highly salient or idiosyncratic experiences in this domain.

Arguably, the most serious source of sampling bias in the current dissertation is the inclusion of Mensa members as representatives of gifted individuals. Because not every gifted individual in Germany is a member of this organization, Mensa members may not be typical of the general population of gifted individuals. As stated earlier (Section 4.4.3), it could be that the Mensa membership represents some kind of compensation for certain social problems. For example, it may be that gifted people who do not feel valued by their family members join Mensa to bolster their general sense of self-esteem. After all, Mensa is highly elitist in the sense that all members have an extremely high intelligence, a trait that is very positively valued in present-day society. In any case, the extent to which Mensa members are unrepresentative of gifted individuals in general limits the generalizability of the current results.

### 5.5.4 Lack of Experimental Data

A final limitation of the current dissertation is the lack of controlled, experimental data.[52] Such data does not permit the drawing of causal inferences. For example, in Sample 4 it was found that vocabulary level is positively associated with MU. In the theoretical framework of Chapter 2, this association is explained by the fact that having a large vocabulary facilitates the encoding and decoding of thoughts and feelings, leading to higher levels of MU. However, it could also be that the positive association between both factors is based on a third factor. One possibility is that individuals from privileged socioeconomic backgrounds acquire better language skills during the course of

[52] Because the experimental manipulation in Study 4 apparently failed, only naturalistic observations and self-reports were drawn from this source. Therefore, results based on these data are not experimental in the strict sense of the word.

socialization and are also better equipped to deal with the complexities of social life. If this is true, then the correlation between vocabulary and MU has nothing to do with actual communication ability but is a spurious result of a shared association with "social capital" (Bourdieu, 1986). In this and all other cases of cross-sectional results, statements about causal mechanisms must remain tentative at best.

## 5.6 Strengths

In spite of a number of limitations, the current dissertation also has a number of strengths. Specifically, these include the study of naturalistic situations, the inclusion of multiple assessment methods, the use of dyadic designs, and the modeling of the hierarchical (nested) data structure with advanced statistical tools. In the following, each of these strengths is discussed in more detail.

### 5.6.1 Use of Multiple Assessment Methods

A further strength of the current study is the use of a broad array of assessment methods. This focus on inclusion was present in the broad range of instruments to assess key constructs. For example, intelligence ratings in Samples 1 and 2 were available as a single-item and a self-concept scale. In addition, these ratings were supplemented by the results of psychometric tests of fluid and crystallized intelligence in Samples 3 and 4. Social adjustment was operationalized by the use of self-report scales tapping into individuals' perceived self-worth regarding certain social relationship categories (e.g., with parents, peers) and an ego-centered relationship instrument. Finally, the current dissertation used two different scales (NEO-FFI and BFI) to assess openness to experience and the other Big Five factors.

In their historical review of seventy years of research on personality and close relationships, Cooper and Sheldon (2002) have lamented the pervasive reliance on self-report measures as a common methodological weakness.[53] Because people may be unable or unwilling to accurately report certain intra-psychic phenomena (e.g., whether they

[53] In fact, no less than 77% of all studies exclusively rely on self-reports, whereas only 6% of all studies include behavioral observations.

understood their interaction partner; Nisbett & Wilson, 1977), self-reports may be inaccurate, especially when studying complex patterns of social interactions (Cooper & Sheldon, p. 785). For this reason, the current research supplemented self-report data with behavioral observations of the level of MU in their conversation. Although both self-reports and observations may contain valuable information and none is necessarily "more objective" than the other, it is clear that their combined use greatly increases the confidence that the current findings are not a result of measurement artifacts.

### 5.6.2 Use of Dyadic Design

A second requirement identified by Cooper and Sheldon (2002) for research on personality and social relationships is the use of dyadic designs. In fact, it could even be claimed that social relationships cannot be studied at all when the focus is on single individuals. From such a design, it is only possible to draw conclusions about individuals' *construction* of relational processes, not about these processes themselves. From research on social support (e.g., Sarason et al., 1987), it is well-known that such perceptions sometimes have little in common with individuals' actual social relationships.

Through the use of a dyadic design, it is also possible to discover possible dissociations of effects across dyadic partners. In the current dissertation, Samples 1.II and 4 included data from both members of dyads. As results showed, the correlation between two interaction partners' assessments of relationship quality was not very high. Indeed, results of Study 1.II showed that the association between intelligence ratings and perceived relationship quality differs between Mensa members and their network partners. In addition, Study 4 found that only the personality of the first interviewer influences MU, not the personality of the second interviewer. This dissociation across dyadic partners could not have been uncovered without the inclusion of both dyadic informants.

### 5.6.3 Modeling Nested Data

A further strength of the current dissertation is the analysis of the ego-centered social network data with the use of hierarchical linear modeling (HLM). At present, the overwhelming majority of studies have used generalized assessments of social support (e.g., self-concept of relationships with peers). However, the use of such generalized measures can be criticized because people tend to dispositionally under- or overestimate

the degree of support they perceive from others (Sarason et al., 1987). In order to anchor evaluations to specific relationships, the use of ego-centered networks has been recommended as an alternative (e.g., Neyer, 1997). Because of the greater specificity of this method, the influence of generalized response tendencies can be reduced.

Although the use of an ego-centered technique is to be preferred for methodological reasons, the statistical analysis of such networks has so far proved tedious. This technique allows networks participants to generate networks of varying size and composition. For example, one participant may list 3 network partners including a mother, a father, and one friend, whereas another participant may list 24 contact persons including 13 co-workers. The most common solution thus far has been to aggregate information across certain categories that (almost) all networks have in common (e.g., support by mother, number of friends). However, this procedure ignores a great deal of useable information, such as relationships with categories of persons that are less common (e.g., neighbors, club members). More fundamental, findings about processes *within* a social network (i.e., at the level of individual relationships) may not necessarily generalize to comparisons *across* social networks (i.e., at the participant-specific level; Molenaar, 2004).

By comparison, hierarchical linear modeling approaches allow one to analyze every single network partner/social relationship (van Duijn, van Busschbach, & Snijders, 1999). Technically, this is done by specifying a participant-specific intercept representing the base-line expectation of support in a social network. Moreover, it is possible to include Level 1 characteristics that may influence the relationship (e.g., the gender of the network partner) or dummy variables that allow for a fine-grained distinction between certain relational categories.[54] Finally, HLM uses information on the participant-specific Level 2 to predict each relationship-specific parameter. This methodological innovation holds great promise for future research.

[54] According to J. Nezlek (personal communication, 14 April, 2005), the inclusion of Level 2 variables to predict the beta weights of these relationship-category dummies faces some limitations if certain participants fail to list network partners for a category.

## 5.7 Conclusions and Recommendations for Future Research

The current dissertation gives rise to a number of conclusions and recommendations for future research. First, the current dissertation provides arguments for the usefulness of MU as a construct in personality and social relationships research. Second, the presence of limited main effects of vocabulary on emerging social relationships has theoretical implications for understanding dynamic transactions between persons and their environment. Third, it seems that people are able to bridge between-person differences in personality. Finally, some recommendations for future research are formulated. In the following, each of these points is elaborated in more detail.

### 5.7.1 Usefulness of MU Construct

First of all, the current dissertation points to MU as a potentially important construct in social relationship research. The data from Study 4 demonstrate that MU is only moderately related to more generalized indicators of interpersonal liking, such as rapport. Results from Studies 1-3 were consistent with theoretical accounts that have postulated a high degree of convergence between MU and more diffuse, emotional qualities in well-established relationships (Reis, 1990). The lack of such strong convergence in newly establishing relationships supports the notion that MU is more independent from generalized relationship quality in newly-emerging relationships. It would be interesting to see whether MU and relationship quality become increasingly correlated as relationships mature.

A promising way to investigate the mechanisms by which MU affects the establishment of more intimate relationships is to consider its effect on outcome expectancies. According to Sunnafrank, Ramirez, and Metts (2004), people getting acquainted have perceptions regarding the "outcome value" they can expect from the other person. When an individual expects highly rewarding future interactions with an interaction partner, he or she will strive to increase interaction intensity. Because felt understanding is a highly rewarding state in social relationships (Fehr, 2004), a high degree of MU should be an important predictor of relationship continuation and quality.

In spite of the potential theoretical relevance of MU, its determinants remain somewhat elusive. That is, only a few of the hypothesized main and emergent effects of personality were confirmed in the current study, and these effects were often restricted to

certain assessment methods (self-ratings vs. partner-ratings) or persons (e.g., interviewer 1 vs. interviewer 2). Of course, this does not exclude the possibility of an association between MU and social and personality factors not included in the present study. For example, it could be that people feel most understood when they encounter a highly acquiescent partner who agrees with everything they say. Moreover, it is possible that dyadic partners' congruence of goals increases their sense of MU. Finally, it is possible that MU is maximized when two people are similar in terms of the personality constructs that are most central to their identities. Future research is needed to substantiate these possibilities.

### 5.7.2 Limited Main Effects in Study 4

In Study 4 found main effects of intelligence were limited to the person who played the role of interviewer in the first interaction half. Because this phenomenon occurred for both vocabulary test results and intelligence ratings by the interaction partner, it is less likely that this pattern was produced by chance. Rather, the dissociation between the effects found for the first and second interviewer may be a result of different behavioral opportunities associated with the experimental context. Specifically, it is possible that the first interviewer had more opportunities to "channel" the conversation by asking questions and reacting to the utterances of the interviewee. By comparison, the possibilities of the first interviewer's interaction partner to influence the communication were more limited. Of course, he or she could choose the topic of the conversation, but because of the structured nature of the situation, the establishment of MU during this interaction half was probably more dependent on the first interviewer.

The above-described differential opportunities for the first and second interviewers' personality to influence the quality of their interaction calls to mind Henry Murray's (1938) concept of "press", which he defined as the directional force of an environment, object, or person. As the current results suggest, the "press of personality" (Thorne, 1987) may vary according to the dynamic, temporal, and social role properties of the environment. Apparently, people who get acquainted develop relatively stable perceptions of their emerging relationship rather quickly (Sunnafrank et al., 2004), which limits the time frame for personality traits to influence this process. After this initial phase, relationships may come to depend more on the (negotiated) interaction history between

both dyadic partners (Clark and Marshall, 1992) that is not captured by the additive effect of their personalities.

### 5.7.3 Bridging Between-Person Differences

The final main conclusion of the current dissertation is that people are able to bridge between-person differences in intelligence and dispositional valuations. To speak with John Donne (1573-1631), no man is an island; people can reach out and understand each other's thoughts and feelings even though they have different personalities. In a sense, this represents an upbeat message. After all, if between-person differences in personality were to pose a serious threat to interpersonal communication, society would eventually transform into a conglomeration of relatively homogeneous subgroups of like-minded others (e.g., as predicted by Herrnstein & Murray, 1994, for intelligence). The fact that people seem able to overcome such differences, at least in the contexts of well-established relationships and interactions between strangers, provides indirect evidence against this position.

At first sight, the conclusion that dyadic differences did not seem to affect people's level of mutual understanding runs against common sense. After all, folk wisdom has it that "birds of a feather flock together", and couples break up because "they are just too different". In the context of romantic relationships, work by researchers such as Murray et al. (2002) has led to some intriguing conclusions regarding this common wisdom. That is, when people *think* they are very much different from their partners, they tend to report less satisfying and stable relationships. Researchers have also shown, however, that this perception is independent of actual between-person differences, which are unrelated to relationship quality. Consistent with this, the current study provides evidence that people are able to establish mutually understanding relationships even when they have very different personalities.

Simonton (1985, p. 536) acknowledged that it may be possible for "a truly intelligent individual [… to] avoid 'talking over the heads' of fellow group members [and thus] get around the comprehensibility limitation […]" However, he hypothesized that highly intelligent people will not usually lower the complexity of their utterances, as "it is probably more difficult in small problem-solving and social groups to accomplish such simplification without sounding insincere or condescending." In contrast to Simonton's

assumption, the current findings suggest that people place a high importance on establishing a sense of MU with their interaction partners, even if this comes at the price of lowering the complexity of their utterances.

## 5.7.4 Recommendations

From the current dissertation, a number of recommendations for future research can be derived. Specially, it is argued that future research would benefit from the use of more representative samples, a variation of task demands, the inclusion of objective tests of MU, and the online assessment of interpersonal perceptions. In the following, each of these recommendations is discussed in more detail.

### 5.7.4.1 More Representative Samples

First of all, it is imperative that future studies are conducted with more representative samples. For example, it would be highly informative to compare an unselected gifted sample with a matched comparison group of average intelligence. Only this way, can it be ruled out that differences between both groups are the result of sample selection bias. Another possible effect of sample bias may stem from the use of university students in Study 4, who can be expected to have a restricted range of above-average intelligence scores. Because range restriction attenuates the correlation between two variables, the inclusion of a more diverse sample may have uncovered significant associations between mutual understanding and between-person differences in personality.

Note, however, that the inclusion of more representative samples comes with a number of additional methodological challenges. Because society is segmented according to intelligence, people with different intelligence levels may also have quite different habitats, which may act to limit the exchange of shared experiences (Duck, 1994). For example, if a university professor is not able to communicate satisfyingly with a construction worker, this may be due to the former person's more sophisticated vocabulary. However, it may also be that the two persons live such different lives that they have "nothing to share". Thus, future studies need to deal carefully with the problem of separating the effects of "pure" intelligence from more lifestyle-related aspects of personality.

#### 5.7.4.2 Objective Tests of MU

According to Jones and Guerrero (2001, p. 571), normal conversations are characterized by a minimal level of person-centeredness. That is, there exist strong social pressures to act in a civilized manner and react with a modicum of interest and respect to other people's utterances. Such "polite" expressions of understanding may obscure an inability to understand deeper layers of meaning and hinder the progression of the MU process. Accordingly, future studies should include more precise, performance-based indicators of MU that transcend the immediate reactions of both dyadic partners to the interaction (see also Section 5.5.1 for the limitations of relying on subjective assessments of MU).

A starting point for the development of more objective tests of MU could be Ickes's (1993) mind-reading paradigm. This paradigm works with videotaped interactions between two people. In Ickes (1993) original method, the tape is shown to each interaction partner separately, who have to indicate when they remember having had a significant thought and describe the content of that thought. In a second step, the other person is shown the video, which is paused at the moments where the interaction partner had previously stated thinking about something. Empathic accuracy is operationalized as the degree to which participants are able to predict what their interaction partners were thinking about at that time.

An interesting approach would be to adapt the method developed by Ickes (1993) to conform to the dynamic features of the MU phenomenon. For example, participants could be made to view a tape of their dyadic interaction, which is stopped after each speaking turn. MU could then be operationalized as the degree to which the listener's interpretation of the meaning of the utterance corresponds to the intended meaning by the speaker. Alternatively, when the focus on such short, verbatim interaction turns does not produce enough diverging interpretations, listeners could be asked to provide a short summary of the subjective, psychological meaning of their interaction partners' narrative. In this case, the measure of MU would be the degree to which the speaker can identify with this summary.

#### 5.7.4.3 Online Measurement of Perception Changes

A final recommendation for future research concerns the use of more dynamic designs to measure perceptions of MU and dyadic differences across time. In the current

Study 4, half of the participants were told that they were either very similar or dissimilar to their interaction partners. Unexpectedly, intelligence ratings provided *after* the 20-minute conversation failed to show a significant effect of this manipulation: Participants who were told they were very different did not perceive more differences than participants who were told they were highly similar. Provided that participants believed the performance feedback (based on their pretest results) at the time it was given, these first impressions seem to have given way to an alternative view based on cues from the ongoing conversation. Possibly, they engaged in a process of identity negotiation (Swann, 1987) during the conversation, eliminating the effect of the experimental manipulation.

Similar to perceptions of dyadic differences, the perceived level of MU might go up or down as well, depending on experiences made within the conversation. In the current study, there was an increase in observed MU across time, but it is not known whether this increase was paralleled by an increase in subjective feelings of understanding and being understood. According to Sunnafrank et al. (2004), people quickly develop expectations regarding the predicted outcome value of certain relationships. These expectations supposedly guide the selection of topics that are discussed during the conversation. If people want to increase relational contact, they will choose a topic they think will be of interest their interaction partner. If this is the case, both dyadic partners may stick to this topic instead of broadening their conversation (i.e., as Duck, 1994, predicts). In such a case, perceptions of MU may be highly stable across the conversation. However, when a chosen topic receives a more mixed reception by the interaction partner, the feeling of being understood may momentarily drop and only become reestablished once a "secure" alternative topic is found.

A way to test this notion is to assess social perceptions of both dyadic partners' personalities and MU at multiple moments of their interaction history. Ideally, this would involve pre-interaction assessments of interpersonal sympathy and expected MU on the basis of personality profiles, followed by similar assessments after participants are shown a picture of each other. When these individuals eventually meet, regular assessments may then capture dynamic changes in their perceptions of themselves, their interaction partners, and the emerging relationship between them. These changes could then be contrasted with pretest measures or modeled with dynamic statistical methods. Note, however, that such designs may be difficult to implement because of constraints in participants' motivation

and cognitive capacity. In addition, they also go hand in hand with a danger of disclosing the research hypothesis by asking repeated and/or obvious questions (Sunnafrank, 1992).

#### 5.7.4.4 Variation of Task Demands

Of course, the conclusions of the current dissertation may only apply to a limited context. After all, there are many more personality variables than intelligence, openness to experience, interests, and values. In addition, different relationship contexts other than the ones studied here exist. For example, it may be that dyadic similarity is more important when people engage in conversations about idiosyncratic or unusual phenomena or when they have to rely on less than optimal communication media (e.g., telephone calls in long-distance relationships). Accordingly, future studies should try to vary communicative task demands when they want to assess the impact of between-person personality differences.

One of the most promising ways to vary task demands may be to increase the level of intellectual demands of the communicative situation. This follows directly from Simonton's (1985) model, which states that in competitive, task-focused groups, between-person differences in the intelligence of group members limit the ability of the more intelligent members to make themselves understood. Although the current study failed to replicate this notion in more emotion-focused situations, this does not mean that the premise of the Simonton model is wrong. Future studies could explicitly test this option by creating conditions in which participants are motivated to display their highest possible level of intellectual sophistication (e.g., by awarding rewards to more complicated messages) while interacting with another person. It is predicted that this will produce the conditions where between-person differences impair the level of MU.

# 6 References

Ackerman, P. L. (1996). A theory of adult intellectual development: Process, personality, interests, and knowledge. *Intelligence, 22*, 227-257.

Adams, G., Anderson, S. L., & Adonu, J. K. (2004). The cultural grounding of closeness and intimacy. In D. Mashek & A. Aron (Eds.), *The handbook of closeness and intimacy.* Mahwah: Lawrence Erlbaum Associates.

Albrecht, T. L., & Adelman, M. B. (1987). *Communicating social support*. Thousand Oaks: Sage Publications.

Amthauer, R., Brocke, B., Liepmann, D. & Beauducel, A. (2001) *Intelligenz-Struktur-Test 2000-R*. Göttingen: Hogrefe.

Applegate, J. L., Kline, S. L., & Delia, J. G. (1991). Alternative measures of cognitive complexity as predictors of communication performance. *International Journal of Personal Construct Psychology, 4*, 193-213.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, *55*, 469-480.

Asendorpf, J. B. (2003). *Psychologie der Persönlichkeit (3 ed.)*. Berlin: Springer.

Asendorpf, J. B., & Wilpers, S. (1998). Personality effects on social relationships. *Journal of Personality and Social Psychology, 74*, 1531-1544.

Ashton, M. C., Lee, K., Vernon, P. A., & Lang, K. L. (2000). Fluid intelligence, crystallized intelligence, and the Openness/Intellect factor. *Journal of Research in Personality, 34*, 198-207.

Bailey, K. G., & Lazar, J. (1976). Accuracy of self-ratings of intelligence as a function of sex and levels of ability in college students. *Journal of Genetic Psychology, 129*, 279-290.

Bailey, R. C., & Mettetal, G. W. (1977a). Perceived intelligence in married partners. *Social Behavior and Personality, 5*, 137-141.

Bailey, R. C., & Mettetal, G. W. (1977b). Sex differences in the congruency of perceived intelligence. *Journal of Genetic Psychology, 131*, 29-36.

Baldwin, M. W. (1992). Relational schemas and the processing of social information. *Psychological Bulletin*, *112*, 461–484.

Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. *American Psychologist, 52*, 366-380.

Baltes, P. B., Staudinger, U. M., & Lindenberger, U. (1999). Lifespan psychology: Theory and application to intellectual functioning. *Annual Review of Psychology, 50*, 471-507.

Barker, D.B. (1991). The behavioral analysis of interpersonal intimacy in group development. *Small Group Research*, *22*, 76-91.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*, 497-529.

Belsky, J. K. (1990). The psychology of aging: Theory, research, and interventions. Pacific Grove: Brooks/Cole Publishing Company.

Bergmann, C., & Eder, F. (1992). *Allgemeiner Interessen-Struktur-Test*. Weinheim: Beltz Verlag.

Bernieri, F. J., & Rosenthal, R. (1991). Interpersonal coordination: Behavior matching and interactional synchrony. In R. S. Feldman & B. Rime (Eds.), *Fundamentals of nonverbal behavior: Studies in emotion & social interaction* (pp. 401-432). New York: Cambridge University Press.

Bernieri, F. J., Gillis, J. S., Davis, J. M., & Grahe, J. E. (1996). Dyad rapport and the accuracy of its judgment across situations: A lens model analysis. *Journal of Personality and Social Psychology, 71*, 110-129.

Bickley, P. G., Keith, T. Z., & Wolfle, L. M. (1995). The three-stratum theory of cognitive abilities: Test of the structure of intelligence across the life span. *Intelligence*, *20*, 309-328.

Bögels, T., de Mey, H., & Derksen, J. (1996). Psychische problemen onder hoogbegaafden. *Gedrag & Gezondheid, 24*, 90-97.

Borkenau, P. & Ostendorf, F. (1993). *NEO-Fünf-Faktoren-Inventar (NEO-FFI) nach Costa und McCrae.* Göttingen: Hogrefe.

Borkenau, P., & Liebler, A. (1993). Convergence of stranger ratings of personality and intelligence with self-ratings, partner ratings, and measured intelligence. *Journal of Personality and Social Psychology, 65*, 546-553.

Botwin, M. D., Buss, D. M., & Shackelford, T. K. (1997). Personality and mate preference: Five factors in mate selection and marital satisfaction. *Journal of Personality*, *65*, 107-136.

Bouchard, T. J., Jr., & McGue, M. (1981). Familial studies of intelligence: A review. *Science*, *212*, 1055–1059.

Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *The handbook of theory: Research for the sociology of education* (pp. 241-258). New York: Greenwood Press.

Brody, N. (2004). What cognitive intelligence is and what emotional intelligence is not. *Psychological Inquiry*, *15*, 234-238.

Bryk, A. S., & Raudenbush, S. W. (1992*). Hierarchical linear models in social and behavioral research: Applications and data analysis methods*. Newbury Park: Sage Publications.

Buck, R. (1983). Nonverbal receiving ability. In J. M. Wiemann & R. P. Harrison (Eds.), *Nonverbal interaction* (pp. 209-242). Thousand Oaks: Sage.

Burr, J. A. & Nesselroade, J. R. (1990). Change measurement. In A. von Eye (Ed.), *Statistical methods in longitudinal research* (pp. 3-34). New York: Academic Press.

Byrne, D. (1971). *The attraction paradigm*. New York: Academic Press.

Byrne, D. (1997). An overview (and underview) of research and theory within the attraction paradigm. *Journal of Social & Personal Relationships, 14*, 417-431.

Cain, K., Oakhill, J., & Lemmon, K. (2004). Individual differences in the inference of word meanings from context: The influence of reading comprehension, vocabulary knowledge, and memory capacity. *Journal of Educational Psychology, 96*, 671-681.

Cairns, R. B., & Cairns, B. D. (2000). The natural history and developmental functions of aggression. In A. J. Sameroff, M. Lewis, & S. M. Miller (Eds.), *Handbook of developmental psychopathology* (pp. 403-429). Dordrecht: Kluwer Academic Publishers.

Caldwell, M. A., & Peplau, L. A. (1982). Sex differences in same-sex friendship. *Sex Roles*, *8*, 721-732.

Cappella, J. N. (1997). Behavioral and judged coordination in adult informal social interactions: Vocal and kinesic indicators. *Journal of Personality and Social Psychology, 72*, 119-131.

Cappella, J. N., & Palmer, M. T. (1990). Attitude similarity, relational history, and attraction: The mediating effects of kinesic and vocal behaviors. *Communication Monographs, 57*, 161-183.

Caroll, J. B. (1993). *Human cognitive abilities: A survey of factor analytic studies*. Cambridge: Cambridge University Press.

Carstensen, L. L. (1992). Social and emotional patterns in adulthood: Support for socioemotional selectivity theory. *Psychology and Aging*, *7*, 331-338.

Cattell, R. B. (1963). Theory of fluid and crystallized intelligence: *A critical experiment. Journal of Educational Psychology*, *54*, 1-22.

Cattell, R. B. (1971). *Abilities: Their structure, growth, and action*. Boston: Houghton Mifflin.

Chandler, D. (1994): *Semiotics for beginners* [Online]. Retrieved June, 2004, from The University of Wales, Aberystwyth, Media and Communications Studies Web site: http://www.aber.ac.uk/media/Documents/S4B/.

Cheng, C, Bond, M. H, & Chan, S. C (1995). The perception of ideal best friends by Chinese adolescents. *International Journal of Psychology*, *30*, 91-108.

Ciarrochi, J. V., Chan, A. Y., & Caputi, P. (2000). A critical evaluation of the emotional intelligence construct. *Personality & Individual Differences, 28*, 539-561.

Clark, H. H. (1992). *Arenas of language use*. Chicago: University of Chicago Press.

Clark, H. H., & Marshall, C. R. (1981). Definite reference and mutual knowledge. In A. K. Joshi, B. L Webber, & I. A. Sag (Eds.), *Elements of discourse understanding* (pp. 10-63). Cambridge: Cambridge University Press.

Cleland, A. A., & Pickering, M. J. (2003). The use of lexical and syntactic information in language production: Evidence from the priming of noun-phrase structure. *Journal of Memory & Language, 49*, 214-230.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112,* 155-159.

Cohen, S., Underwood, L. G., & Gottlieb, B. H. (2000). *Social support measurement and intervention: A guide for health and social scientists*. New York: Oxford University Press.

Colvin, C., Vogt, D., & Ickes, W. J. (1997). Why do friends understand each other better than strangers do? In W. J. Ickes (Ed.), *Empathic accuracy* (pp. 169-193). New York: Guilford Press.

Cooper, M. L. (2002). Personality and close relationships: Embedding people in important social contexts. *Journal of Personality, 70*, 757-782.

Cooper, M. L., & Sheldon, M. S. (2002). Seventy years of research on personality and close relationships: Substantive and methodological trends over time. *Journal of Personality, 70*, 783-812.

Cronbach, L. J., & Gleser, G. C. (1953). Assessing similarity between profiles. *Psychological Bulletin, 50*, 456-473.

Davies, M., Stankov, L. & Roberts, R. D. (1998). Emotional intelligence: In search of an elusive construct. *Journal of Personality and Social Psychology, 75,* 989-1015.

Davis, M. H., & Kraus, L. A. (1997). Personality and empathic accuracy. In W. J. Ickes (Ed.), *Empathic accuracy* (pp. 144-168). New York: Guilford Press.

de Dreu, C. K. W., Koole, S. L., & Oldersma, F. L. (1999). On the seizing and freezing of negotiator inferences: Need for cognitive closure moderates the use of heuristics in negotiation. *Personality & Social Psychology Bulletin, 25*, 348-362.

de Saussure, F. (1916). *Course in general linguistics* (R. Harris, trans.). New York : McGraw-Hill.

Döring, N., & Bortz, J. (1993). Psychometrische Einsamkeitsforschung: Deutsche Neukonstruktion der UCLA Loneliness Scale. *Diagnostica, 39*, 224-239.

Duck, S. (1994). *Meaningful relationships: Talking, sense, and relating.* Thousand Oaks: Sage.

Dunning, D., & Cohen, G. L. (1992). Egocentric definitions of traits and abilities in social judgment. *Journal of Personality and Social Psychology*, *63*, 341-355.

Eco, U. (1965). Towards a semiotic enquiry into the television message. In J. Corner & J. Hawthorn (Eds.), *Communication studies: An introductory reader*. London: Adward Arnold.

Ekman, P. (2003). Emotions revealed: Recognizing faces and feelings to improve communication and emotional life. New York: Times Books/Henry Holt and Co.

Emmers-Sommer, T. M. (2004). The effect of communication quality and quantity indicators on intimacy and relational satisfaction. *Journal of Social & Personal Relationships, 21*, 399-411.

Fehr, B. (2004). Intimacy expectations in same-sex friendships: A prototype interaction-pattern model. *Journal of Personality and Social Psychology, 86*, 265-284.

Feng, D., & Baker, L. (1994). Spouse similarity in attitudes, personality, and psychological well-being. *Behavior Genetics, 24*, 357-364.

Flynn, J. R. (2003). Movies about intelligence: The limitations of g. *Current Directions in Psychological Science, 12*, 95-99.

Fraley, B., & Aron, A. (2004). The effect of a shared humorous experience on closeness in initial encounters. *Personal Relationships, 11*, 61-78.

Furnham, A. (2001). Self-estimates of intelligence: Culture and gender difference in self and other estimates of both general (g) and multiple intelligences. *Personality and Individual Differences, 31*, 1381-1405.

Furnham, A., & Rawles, R. (1999). Correlations between self-estimated and psychometrically measured IQ. *Journal of Social Psychology, 139*, 405-410.

Fussell, S. R., & Krauss, R. M. (1992). Coordination of knowledge in communication: Effects of speakers' assumptions about what others know. *Journal of Personality and Social Psychology, 62*, 378-391.

Gabriel, M. T., Critelli, J. W., & Ee, J. S. (1994). Narcissistic illusions in self-evaluations of intelligence and attractiveness. *Journal of Personality*, *62*, 143-155.

Gagné, F. M. (1991). Toward a differentiated model of giftedness and talent. In N. Colangelo & G. A. Davis (Eds.), *Handbook of gifted education* (pp. 65-80). Boston: Allyn and Bacon.

Gagné, F. M., & Lydon, J. E. (2004). Bias and accuracy in close relationships: An integrative review. *Personality & Social Psychology Review, 8*, 322-338.

Ghiselli, E. E. (1963). Managerial talent. *American Psychologist*, *18*, 631-542.

Gibb, C. A. (1947). The principles and traits of leadership. *Journal of Abnormal and Social Psychology, 42*, 267-284.

Gignac, G. E., Stough, C., & Loukomitis, S. (2004). Openness, intelligence, and self-report intelligence. *Intelligence, 32*, 133-143.

Goldstein, J. (1943). An exploratory analysis of opinion trends with special reference to conscription in the United States. *Sociometry*, *6*, 156-181.

Gonzalez, R., & Griffin, D. (2002). Modeling the personality of dyads and groups. *Journal of Personality, 70*, 901-924.

Gordon, R. A. (1997). Everyday life as an intelligence test: Effects of intelligence and intelligence context. *Intelligence, 24*, 203-320.

Guilford, J. P. (1967). *The nature of intelligence*. New York: McGraw-Hill.

Gurtman, M. B. (1995). Personality structure and interpersonal problems: A theoretically-guided item analysis of the Inventory of Interpersonal Problems. *Assessment, 2*, 343-361.

Gustafsson, J.-E. (1988). Hierarchical models of individual differences in cognitive abilities. In R. J. Sternberg (Ed.), *Advances in the psychology of human intelligence* (pp. 35-71). Hillsdale: Erlbaum.

Harris, J. A. (2004). Measured intelligence, achievement, openness to experience, and creativity. *Personality & Individual Differences, 36*, 913-929.

Heaven, P. C. L., & Oxman, L. N. (1999). Human values, conservatism and stereotypes of homosexuals. *Personality & Individual Differences*, *27*, 109-118.

Hebb, D. O. (1949). The organization of behavior. New York: Wiley.

Hecht, M. (1978). The conceptualization and measurement of interpersonal communication satisfaction. *Human Communication Research*, *4*, 253–264.

Heller, K. A. (2001). *Hochbegabung im Kindes- und Jugendalter* (2nd ed.). Göttingen: Hogrefe.

Herrnstein, R. J., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life*. New York: Free Press.

Hoge, R. D. and Renzulli, J. S. (1993). *Exploring the link between giftedness and self-concept*. Unpublished paper, University of Connecticut, Connecticut.

Holland, J. L. (1959). A theory of vocational choice. *Journal of Counseling Psychology*, *6*, 35–45.

Hollingworth, L. S. (1942). *Children above 180 IQ Stanford-Binet: Origin and development*. Yonkers-on-Hudson: World Book Company.

Ickes, W. (1993). Empathic accuracy. *Journal of Personality, 61*, 587-610.

Jakobson, R. (1960). Closing statement: Linguistics and poetics. In T.A. Sebeok (Ed.), *Style in Language* (pp. 350-377). Cambridge: MIT Press.

Jakobson, R., & Halle, M. (1956). *Fundamentals of language*. The Hague: Mouton.

Janos, P. M., & Robinson, N. M. (1985). Psychosocial development in intellectually gifted children. In F. D. Horowitz & M. O'Brien (Eds.), *The gifted and talented: Developmental perspectives* (pp. 5-35). Hyattsville: American Psychological Association.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P John (Eds.), *Handbook of*

*personality (2nd ed.): Theory and research* (pp. 102-138). New York: Guilford Press.

Johnson, M. A. (1989). Variables associated with friendship in an adult population. *Journal of Social Psychology, 129*, 379-390.

Johnson, R., Hobfoll, S. E., & Zalcberg-Linetzy, A. (1993). Social support knowledge and behavior and relational intimacy: A dyadic study. *Journal of Family Psychology, 6*, 266-277.

Jones, S. M., & Guerrero, L. K. (2001). The effects of nonverbal immediacy and verbal person centeredness in the emotional support process. *Human Communication Research, 27*, 567-596.

Keating, D. P. (1978). A search for social intelligence. *Journal of Educational Psychology, 70*, 218-223.

Keeley, M., & Hart, A. (1994). Nonverbal behavior in dyadic interaction. In S. W. Duck (Ed.), *Understanding relationships* (pp. 135-162). Thousand Oaks: Sage.

Kellermann, K., & Lim, T.-S. (1990). The conversation MOP: III. Timing of scenes in discourse. *Journal of Personality and Social Psychology, 59*, 1163-1179.

Kellermann, K., & Palomares, N. A. (2004). Topical profiling: Emergent, co-occurring, and relationally defining topics in talk. *Journal of Language & Social Psychology, 23*, 308-337.

Kelly, G. (1955). *The psychology of personal constructs*. New York: W.W. Norton.

Kenny, D. A., & la Voie, L. (1985). Separating individual and group effects. *Journal of Personality and Social Psychology, 48*, 339-348.

Kirton, M. (1976). Adaptors and innovators: A description and measure. *Journal of Applied Psychology, 61*, 622-629.

Koning, C., & Magill-Evans, J. (2001). Social and language skills in adolescent boys with Asperger syndrome. *Autism, 5*, 23-36.

Körner, A., Geyer, M., & Brähler, E. (2002). Das NEO-Fünf-Faktoren Inventar (NEO-FFI): Validierung anhand einer deutschen Bevölkerungsstichprobe. *Diagnostica, 48*, 19-27.

Krauss, R. M., & Fussell, S. R. (1991). Perspective-taking in communication: Representations of others' knowledge in reference. *Social Cognition, 9*, 2-24.

Kruger, J. (1999). Lake Wobegon be gone! The „Below-Average Effect“ and the egocentric nature of comparative ability judgments. *Journal of Personality and Social Psychology, 77*, 221-232.

Kruglanski, A. W. (1990). Lay epistemic theory in the social cognitive psychology. *Psychological Inquiry*, *1*, 181-197.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: University of Chicago Press.

Lang, F. R. & Lüdtke, O. (in preparation). Der Big Five Ansatz der Persönlichkeits-forschung: Instrumente und Vorgehen. In S. Schumann (Ed.), *Persönlichkeit: Eine vergessene Einflussgröße der empirischen Sozialforschung*. Wiesbaden: Westdeutscher Verlag.

Lang, F. R., Lüdtke, O., & Asendorpf, J. B. (2001). Validity and psychometric equivalence of the German version of the Big Five Inventory in young, middle-aged and old adults. *Diagnostica, 47*, 111-121.

Lehrl, S. (1995). *Mehrfachwahl-Wortschatz-Intelligenztest* (MWT-B) (4th ed.). Balingen: Spitta Verlag.

Lewak, R. W., Wakefield, J. A., & Briggs, P. F. (1985). Intelligence and personality in mate choice and marital satisfaction. *Personality & Individual Differences, 6*, 471-477.

Lohman, D. F. (2000). Complex information processing and intelligence. In R. J. Sternberg (Ed.), *Handbook of human intelligence (2nd ed.)* (pp. 285-340). Cambridge: Cambridge University Press.

Lubinski, D., Webb, R. M., Morelock, M. J., & Benbow, C. P. (2001). Top 1 in 10,000: A 10-year follow-up of the profoundly gifted. *Journal of Applied Psychology, 86*, 718-729.

Lykken, D. T., & Tellegen, A. (1993). Is human mating adventitious or the result of lawful choice? A twin study of mate selection. *Journal of Personality and Social Psychology, 65*, 56-68.

MacCann, C., Roberts, R. D., Matthews, G., & Zeidner, M. (2004). Consensus scoring and empirical option weighting of performance-based Emotional Intelligence (El) tests. *Personality & Individual Differences*, *36*, 645-662.

Marsh, H. W. (1986). Verbal and math self-concepts: An internal/external frame of reference model. *American Educational Research Journal, 23*, 129-149.

Marsh, H.W. (1992). *Self Description Questionnaire (SDQ) III: A theoretical and empirical basis for the measurement of multiple dimensions of late adolescent self-concept: An interim test manual and a research monograph*. Macathur: University of Western Sydney, Faculty of Education.

Mascie-Taylor, C. G., & Vandenberg, S. G. (1988). Assortative mating for IQ and personality due to propinquity and personal preference. *Behavior Genetics, 18*, 339-345.

McAdams, D. P. (1989). *Intimacy: The need to be close*. New York: Doubleday.

McCrae, R. R. (1996). Social consequences of experiential openness. *Psychological Bulletin, 120*, 323-337.

McCrae, R. R., Costa, P. T., (1997). Conceptions and correlates of openness to experience. In R. Hogan & J. A. Johnson (Eds.), *Handbook of personality psychology* (pp. 825-847). San Diego: Academic Press.

Mikulincer, M., Florian, V., & Hirschberger, G. (2004). The terror of death and the quest for love: An existential perspective on close relationships. In J. Greenberg, S. L. Koole, & T. Pyszczynski (Eds.), *Handbook of experimental existential psychology* (pp. 287-304). New York: Guilford Press.

Molenaar, P. C. M. (2004). A manifesto on psychology as idiographic science: Bringing the person back into scientific psychology, this time forever. *Measurement, 2*, 201-218.

Murray, H. A. (1938). *Explorations in personality*. New York: Oxford University Press.

Murray, S. L., Bellavia, G., Dolderman, D., Holmes, J.G., & Griffin, D. W. (2002). Kindred spirits? The benefits of egocentrism in close relationships. *Journal of Personality and Social Psychology, 82*, 563-581.

Nagoshi, C. T., Johnson, R. C., & Ahern, F. M. (1987). Phenotypic assortative mating vs. social homogamy among Japanese and Chinese parents in the Hawaii Family Study of Cognition. *Behavior Genetics, 17*, 477-485.

Neff, L. A., & Karney, B. R. (2002). Judgments of a relationship partner: Specific accuracy but global enhancement. *Journal of Personality, 70*, 1079-1112.

Neyer, F. J. (1997). Free recall or recognition in collecting egocentered networks: The role of survey techniques. *Journal of Social and Personal Relationships, 14*, 305-316.

Neyer, F. J. (1999). Die Persönlichkeit junger Erwachsener in verschiedenen Lebensformen. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *51*, 491-508.

Neyer, F. J., Banse, R., & Asendorpf, J. B. (1999). The role of projection and empathic accuracy in dyadic perception between older twins. *Journal of Social and Personal Relationships, 16*, 419-442.

Niederhoffer, K. G., & Pennebaker, J. W. (2002). Linguistic style matching in social interaction. *Journal of Language and Social Psychology, 21*, 337-360.

Nisbett, R., & Wilson, T. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review, 84,* 231-259.

Nohara-LeClair, M. (2001). A direct assessment of the relation between shared knowledge and communication in a referential communication task. *Language & Speech, 44*, 217-236.

Nunnaly, J. (1978). *Psychometric theory*. New York: McGraw-Hill.

O'Keefe, D. J., & Sypher, H. E. (1981). Cognitive complexity measures and the relationship of cognitive complexity to communication. *Human Communication Research, 8*, 72-92.

O'Sullivan, M., Guilford, J. P., & deMille, R. (1965). *The measurement of social intelligence. (Report from the Psychology Laboratory, No. 34).* Los Angeles: University of Southern California.

Paulhus, D. L., & Landolt, M. A. (2000). Paragons of intelligence: Who gets nominated and why. *Canadian Journal of Behavioural Science, 32*, 168-177.

Paulhus, D. L., & Morgan, K. L. (1997). Perceptions of intelligence in leaderless groups: The dynamic effects of shyness and acquaintance. *Journal of Personality and Social Psychology, 72*, 581-591.

Paulhus, D. L., Lysy, D. C., & Yik, M. S. M. (1998). Self-report measures of intelligence: Are they useful as proxy IQ tests? *Journal of Personality, 66*, 525-554.

Phillips, K., Fulker, D. W., Carey, G., & Nagoshi, C. T. (1988). Direct marital assortment for cognitive and personality variables. *Behavior Genetics, 18*, 347-356.

Quay, L. C., Hough, R. A., Mathews, M., Jarrett, O. S. (1981). Predictors of communication encoding: Age, socioeconomic status, and cognitive ability. *Developmental Psychology*, *17*, 221-223.

Rammstedt, B. (1997). *Die deutsche Version des Big Five Inventory (BFI): Übersetzung und Validierung eines Fragebogens zur Erfassung des Fünf-Faktoren-Modells der Persönlichkeit*. Unpublished masters thesis, University of Bielefeld.

Rammstedt, B., & Rammsayer, T. H. (2000). Sex differences in self-estimates of different aspects of intelligence. *Personality and Individual Differences, 29*, 869-880.

Raudenbush, S. W. (1988). Educational applications of hierarchical linear models: A review. *Journal of Educational Statistics*, *1*, 85-116.

Raven, J. C. (1960). *Guide to the Standard Progressive Matrices*. London: Lewis.

Realo, A., et al. (2003). Mind-reading ability: Beliefs and performance. *Journal of Research in Personality, 37*, 420-445.

Reis, H. T. (1990). The role of intimacy in interpersonal relations. *Journal of Social and Clinical Psychology, 9*, 15-30.

Reis, H. T., & Wheeler, L. (1991). Studying social interaction with the Rochester Interaction Record. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 24, pp. 270-318). San Diego: Academic Press.

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin*, *26*, 419-435.

Renzulli, J. (1986). The three ring conception of giftedness: A developmental model for creative productivity. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 53-92). New York: Cambridge University Press.

Reynolds, C. A., Baker, L. A., & Pedersen, N. L. (2000). Multivariate models of mixed assortment: Phenotypic assortment and social homogamy for education and fluid ability. *Behavior Genetics, 30*, 455-476.

Richter, L., & Kruglanski, A. W. (1999). Motivated search for common ground: Need for closure effects on audience design in interpersonal communication. *Personality & Social Psychology Bulletin, 25*, 1101-1114.

Roberts, R. D., Zeidner, M., & Matthews, G. (2001). Does emotional intelligence meet traditional standards for an intelligence? Some new data and conclusions. *Emotion, 1*, 196-231.

Rokeach, M. (1973). *The nature of human values*. New York: Free Press.

Rost, D. H. (Ed.) (2000). *Hochbegabte und hochleistende Jugendliche*. Münster: Waxmann.

Roznowski, M., Reith, J., & Hong, S. (2000). A further look at youth intellectual giftedness and its correlates: Values, interests, performance, and behavior. *Intelligence, 28*, 87-113.

Sarason, B. R., Shearin, E. N., & Pierce, G. R. (1987). Interrelations of social support measures: Theoretical and practical implications. *Journal of Personality and Social Psychology*, *52*, 813-832.

Schmitt, P. V., & Strein, W. (1987). Self-ratings versus actual WAIS-R performance. *Psychological Reports, 61*, 905-906.

Schneider, B. H., Clegg, M. R., Byrne, B. M., Ledingham, J. E., & Crombie, G. (1989). Social relations of gifted children as a function of age and school program. *Journal of Educational Psychology, 81*, 48-56.

Schwanzer, A. (2002). *Entwicklung und Validierung eines deutschsprachigen Instruments zur Erfassung des Selbstkonzepts junger Erwachsener (Materialien aus der Bildungsforschung, Nr. 74).* Berlin: Max-Planck-Institut für Bildungsforschung.

Shanley, L. A., Walker, R. E., & Foley, J. M. (1971). Social intelligence: A concept in search of data. *Psychological Reports, 29*, 1123-1132.

Simonton, D. K. (1985). Intelligence and personal influence in groups: Four nonlinear models. *Psychological Review, 92*, 532-547.

Snyder, D. (1979). Multidimensional assessment of marital satisfaction. *Journal of Marriage and the Family, 41*, 813-823.

Stahl, S. A., & Fairbanks, M. M. (1986). The effects of vocabulary instruction: A model-based meta-analysis. *Review of Educational Research, 56*, 72-110.

Sternberg, R. J. (2000). The concept of intelligence. In R. J. Sternberg (Ed.), *Handbook of intelligence* (pp. 3-15). Cambridge: Cambridge University Press.

Sunnafrank, M. (1983). Attitude similarity and interpersonal attraction in communication processes: In pursuit of an ephemeral influence. *Communication Monographs, 50*, 273-284.

Sunnafrank, M. (1984). A communication-based perspective on attitude similarity and interpersonal attraction in early acquaintance. *Communication Monographs, 51*, 372-380.

Sunnafrank, M. (1992). On debunking the attitude similarity myth. *Communication Monographs, 59*, 164-179.

Sunnafrank, M., Ramirez, A., Jr., & Metts, S. (2004). At first sight: Persistent relational effects of get-acquainted conversations. *Journal of Social & Personal Relationships, 21*, 361-379.

Swann, W. B. (1987). Identity negotiation: Where two roads meet. *Journal of Personality and Social Psychology, 53*, 1038-1051.

Taft, R. (1971). A note on the characteristics of the members of MENSA, a potential subject pool. *The Journal of Social Psychology, 83*, 107-111.

Tambs, K., Sundet, J. M., & Berg, K. (1993). Correlations between identical twins and their spouses suggest social homogamy for intelligence in Norway. *Personality & Individual Differences, 14*, 279-281.

Taylor, S. E., Lerner, J. S., Sherman, D. K., Sage, R. M., & McDowell, N. K. (2003). Portrait of the self-enhancer: Well adjusted and well liked or maladjusted and friendless? *Journal of Personality and Social Psychology, 84*, 165-176.

Terman, L. M. & Oden, M. H. (1959). *The gifted group at mid-life: Thirty-five years' follow-up of the superior child*. Stanford: Stanford University Press.

Terman, L. M. (1925). *Mental and physical traits of a thousand gifted children.* Stanford: Stanford University Press.

Thomas, G., & Fletcher, G. J. O. (2003). Mind-reading accuracy in intimate relationships: Assessing the roles of the relationship, the target, and the judge. *Journal of Personality and Social Psychology, 85*, 1079-1094.

Thorne, A. (1987). The press of personality: A study of conversations between introverts and extraverts. *Journal of Personality and Social Psychology, 53*, 718-726.

Tickle-Degnen, L., & Rosenthal, R. (1990). The nature of rapport and its nonverbal correlates. *Psychological Inquiry*, *1*, 285-293.

Todt, E. (1989). Diagnose von Werthaltungen. *Diagnostica*, *2*, 97-108.

Tomasello, M. (2000). *The cultural origins of human cognition*. Cambridge: Harvard University Press.

Ullstadius, E., Gustafsson, J.-E., & Carlstedt, B. (2002). Influence of general and crystallized intelligence on vocabulary test performance. *European Journal of Psychological Assessment*, *18*, 78-84.

van Duijn, M. A. J., van Busschbach, J. T., & Snijders, T. A. B. (1999). Multilevel analysis of personal networks as dependent variables. *Social Networks*, *21*, 187-209.

Vandenberg, S. G. (1972). Assortative mating, or who marries whom? *Behavior Genetics, 2*, 127-157.

Vaux, A. (1992). Assessment of social support. In H. O. F. Veiel & U. Baumann (Eds.), *The meaning and measurement of social support* (pp. 193-216). Washington DC: Hemisphere.

Verhaeghen, P. (2003). Aging and vocabulary score: A meta-analysis. *Psychology & Aging*, *18*, 332-339.

Waller, N. G. (1999). Evaluating the structure of personality. In C. R. Cloninger (Ed), *Personality and psychopathology* (pp. 155-197). Washington, DC: American Psychiatric Press.

Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of Personality and Social Psychology*, *67*, 1049-1062.

Wechsler, D. (1958). *The measurement and appraisal of adult intelligence*. Baltimore: Williams and Wilkins.

Wellman, H. M. (1990). *The child's theory of mind.* Cambridge: MIT Press.

Wilhelm, O. (2000). *Psychology of reasoning: Testing structural theories.* Unpublished doctoral dissertation, University of Mannheim.

Wilkes-Gibbs, D., & Clark, H. H. (1992). Coordinating beliefs in conversation. *Journal of Memory & Language, 31*, 183-194.

Wilson, T. D., & Gilbert, D. T. (2003). Affective forecasting. In M. Zanna (Ed.), *Advances in experimental social psychology* (pp. 345-411). New York: Elsevier.

Zebrowitz, L. A., Hall, J. A., Murphy, N. A., & Rhodes, G. (2002). Looking smart and looking good: Facial cues to intelligence and their origins. *Personality & Social Psychology Bulletin, 28*, 238-249.

Zeidner, M., Matthews, G., & Roberts, R. D. (2001). Slow down, you move too fast: Emotional intelligence remains an „elusive" intelligence. *Emotion, 1*, 265-275.

Zeidner, M., Roberts, R. D., & Matthews, G. (2004). The emotional intelligence bandwagon: Too fast to live, too young to die? *Psychological Inquiry, 15*, 239-248.

# 7 Appendices

## 7.1 Setup of Dyadic Conversation in Study 4

## 7.2 Ego-Centered Social Network Instrument

**Die folgenden Fragen beziehen sich auf die Personen, die in Ihrem Leben eine wichtige Rolle spielen –positiv oder negativ- und mit denen Sie in den letzten Monaten mindestens einmal pro Monat Kontakt hatten.** *Kontakt haben* kann bedeuten, länger mit einer Person zu sprechen, zu telefonieren, oder eine schriftliche Nachricht mit persönlichem Inhalt von ihr zu erhalten oder ihr zu senden.

**Schritt 1: Erstellen einer Personenliste**

In einem **ersten Schritt** möchten wir gemeinsam mit Ihnen die betreffenden Personen einzeln bestimmen. Nehmen Sie zu diesem Zweck bitte die beigefügte **Personenliste** zur Hand. Hier können sie im Folgenden die Personen, die Ihnen als Kontaktpersonen in den Sinn kommen, der Reihe nach eintragen.

Gehen Sie bitte die in dem **unteren Kasten** aufgeführten Personengruppen von oben nach unter durch. Überlegen Sie, zu welchen einzelnen Personen aus den aufgeführten Gruppen Sie in den letzten drei Monaten Kontakt hatten und wer davon für Sie eine wichtige positive oder negative Rolle spielt.

Tragen Sie für jede Person, zu der Sie Kontakt hatten und die für Sie eine entsprechende Bedeutung hat, auf der Namensliste den Vor- oder den Nachnamen ein sowie den zugehörigen Kennbuchstaben der unten aufgeführten Gruppen (Beispiel: **M** für Ihre Mutter, oder **P** für den Partner). Sie können bis zu 35 Personen eintragen, aber natürlich auch weniger. Sollten es insgesamt mehr als 35 Personen werden, ersetzen Sie diejenigen, die Ihnen *gefühlsmäßig am wenigsten bedeuten*, durch andere.

**Kasten: Personengruppen**

| Kennbuchstabe ▼ | |
|---|---|
| ***M*** | Mutter (auch Stiefmutter) |
| ***V*** | Vater (auch Stiefvater) |
| ***G*** | Geschwister (auch halbverwandte und Adoptivgeschwister) |
| ***O*** | Großeltern (auch Eltern von Stiefeltern) |
| ***K*** | Kinder (eigene, Kinder des aktuellen oder ehemaligen Partners, adoptierte) |
| ***Q*** | sonstige Verwandte (z.B. Onkel, Tante, Cousin, Cousine, Nichte, Neffe) |
| ***P*** | Partner (Ehepartner, Lebensgefährte) |
| ***X*** | ehemaliger Partner |
| ***F*** | Freunde bzw. Freundinnen |
| ***N*** | Nachbarn, Mitglieder desselben Wohnheims /Internats/ Kaserne |
| ***C*** | Mitglieder von Clubs, Vereinen oder Gruppen, in denen Sie Mitglied sind |
| ***Ko*** | Kommilitone/Kommilitonin |
| ***Y*** | sonstige Personen (z.B. ehemalige Lehrer, Ärzte, Pfarrer) |
| ***A*** | Arbeitskollege/ Arbeitskollegin |

**Schritt 2: Eintragen der Kontaktpersonen in die Merkmalsliste**

Übertragen Sie bitte danach in einem **zweiten Schritt** der Reihe nach alle Personen, die Sie auf der Personenliste festgehalten haben, in die getrennt beigefügte **Merkmalsliste**.

Auf den Namen der Personen können Sie verzichten. Es genügt, wenn Sie Zeile für Zeile in Spalte 2 im Anschluss an die Personennummer immer den **Kennbuchstaben der zugehörigen Gruppe**, den Sie auch auf der Personenliste notiert haben, für jede Person der Reihe nach eintragen.

**Schritt 3: Beschreibung Ihrer sozialen Beziehungen**

In einem **dritten Schritt** möchten wir Sie bitten, Ihre Beziehungen zu den Personen zu beschreiben. Machen Sie bitte **spaltenweise** für jede Person die folgenden Angaben und tragen Sie die **Ziffer** der jeweils zutreffenden Antwortvorgabe in die Merkmalsliste ein.

Beginnen Sie also mit Spalte 3 und füllen Sie die Spalte 3 für alle Kontaktpersonen von oben nach unten gehend aus. Wenn Sie die Spalte 3 vollständig ausgefüllt haben, füllen Sie die Spalte 4 für alle Kontaktpersonen aus usw. Dieses Vorgehen erleichtert Ihnen die Beurteilung Ihrer Beziehungen zu den verschiedenen Kontaktpersonen; es ist auch schneller als ein zeilenweises Vorgehen.

**Spalte 3: Geschlecht**
Welches Geschlecht hat diese Person?
m männlich
w weiblich

**Spalte 4: Schätzung des Alters**
Wie alt ist diese Person (schätzungsweise)?

**Spalte 5: Dauer der Bekanntschaft mit der Person**
4 Länger als 5 Jahren
3 Zwischen 2-5 Jahren
2 Zwischen 1-2 Jahren
1 Kürzer als 1 Jahr

**Spalte 6: Kontaktfrequenz**
Wie oft hatten Sie in den letzten vier Wochen mit dieser Person Kontakt?
5 täglich
4 mehrmals in der Woche
3 einmal in der Woche
2 mehrmals im Monat
1 mindestens einmal im Monat

**Spalte 7: Bedeutsamkeit der Beziehung**
Wie wichtig ist Ihnen die Beziehung mit dieser Person?
5 Beendigung würde mich stark und lange belasten
4 Beendigung würde mich vorübergehend stark belasten
3 Beendigung würde mich nur kurz belasten
2 Beendigung würde mir nichts ausmachen
1 Es wäre besser für mich, die Beziehung zu beenden

**Spalte 8: Nähe**
Wie nah fühlen Sie sich dieser Person?
5 sehr nahe
4 ziemlich nahe
3 weder nah noch fern
2 ziemlich fern
1 sehr fern

**Spalte 9: Konflikt**
In wiefern gibt es zwischen Ihnen und dieser Person Konflikte, in denen mindestens einer von Ihnen starken Ärger, starke Eifersucht, starke Trauer, starke Scham oder starke Angst empfindet?
5 fast bei jedem Zusammensein
4 oft
3 manchmal
2 selten
1 nie

**Spalte 10: intellektueller/künstlerischer Austausch**
In wiefern können Sie sich mit dieser Person austauschen über Themen, die Ihnen viel bedeuten (z.B. Wissenschaft, Kultur, Politik, Hobbies).

5 sehr gut
4 eher gut
3 weder gut noch schlecht
2 eher nicht so gut
1 überhaupt nicht

**Spalte 11: emotionale Unterstützung**
In wiefern können Sie sich an diese Person wenden, wenn Sie emotionale Probleme haben?

5 bei fast jedem Problem
4 bei vielen Problemen
3 bei manchen Problemen
2 bei wenigen Problemen
1 nie

**Spalte 12: Verständnis**
In wiefern fühlen Sie sich von dieser Person verstanden?

5 sehr verstanden
4 eher verstanden
3 weder verstanden noch unverstanden
2 eher unverstanden
1 sehr unverstanden

## 7.3 Self-Concept Questionnaire

**Selbstkonzept**

Im folgenden Teil finden Sie 34 Aussagen, die sich auf eher instabile Merkmale Ihrer eigenen Person beziehen, also langfristig durchaus Änderungen unterworfen sein könnten. Achten Sie bitte deshalb darauf, die Aussagen jeweils auf Ihr Erleben und Verhalten *in den letzten 4 Wochen* zu beziehen. Lesen Sie bitte jede Aussage aufmerksam durch und überlegen Sie, ob diese Aussage auf Ihr Erleben und Verhalten in den letzten 4 Wochen zutrifft oder nicht. Kreuzen Sie bitte an:

**1 gar nicht** wenn Sie der Aussage auf keinen Fall zustimmen
**2 wenig** wenn Sie der Aussage eher nicht zustimmen
**3 teils-teils** wenn Sie die Aussage weder für richtig noch für falsch halten
**4 ziemlich** wenn Sie der Aussage eher zustimmen
**5 völlig** wenn Sie der Aussage nachdrücklich zustimmen

Bitte lesen Sie jede Aussage genau durch und kreuzen Sie als Antwort die Kategorie an, die Ihre Sichtweise am besten ausdrückt. Falls Sie Ihre Meinung nach dem Ankreuzen einmal ändern sollten, streichen Sie Ihre erste Antwort bitte deutlich durch. Auch wenn Ihnen einmal die Entscheidung schwerfallen sollte, kreuzen Sie trotzdem immer eine Antwort an, und zwar die, welche noch am ehesten auf Sie persönlich zutrifft.

| | Stimmt: | | | | |
|---|---|---|---|---|---|
| | gar nicht | wenig | teils-teils | ziemlich | völlig |
| Im Umgang mit Personen des anderen Geschlechts bin ich ziemlich schüchtern. | 1 | 2 | 3 | 4 | 5 |
| Insgesamt habe ich ein sehr negatives Bild von mir. | 1 | 2 | 3 | 4 | 5 |
| Ich bin künstlerisch oder musikalisch sehr talentiert. | 1 | 2 | 3 | 4 | 5 |
| Meine Eltern haben mich nie besonders respektiert. | 1 | 2 | 3 | 4 | 5 |
| Es gibt Menschen, die mich wirklich verstehen | 1 | 2 | 3 | 4 | 5 |
| Mit anderen Personen meines Geschlechts komme ich nicht so gut klar. | 1 | 2 | 3 | 4 | 5 |
| Ich habe niemanden, an den ich mich wenden kann. | 1 | 2 | 3 | 4 | 5 |
| Ich kann mit anderen zusammensein, wenn ich das will. | 1 | 2 | 3 | 4 | 5 |
| Ich fühle mich von den anderen isoliert. | 1 | 2 | 3 | 4 | 5 |
| Ich kann mich gut mit Personen des anderen Geschlechts unterhalten. | 1 | 2 | 3 | 4 | 5 |
| Nur wenige Personen meines Geschlechts mögen mich. | 1 | 2 | 3 | 4 | 5 |
| Alles in allem kann ich mich selbst nicht besonders gut akzeptieren. | 1 | 2 | 3 | 4 | 5 |
| Alles in allem kann ich mich selbst gut leiden. | 1 | 2 | 3 | 4 | 5 |
| Im Vergleich zu anderen habe ich eine weit überragende Intelligenz. | 1 | 2 | 3 | 4 | 5 |
| Ich schließe leicht Freundschaften mit Personen meines Geschlechts. | 1 | 2 | 3 | 4 | 5 |
| Es gibt kaum Aufgaben, die ich nicht lösen kann. | 1 | 2 | 3 | 4 | 5 |

| | gar nicht | wenig | teils-teils | ziemlich | völlig |
|---|---|---|---|---|---|
| Ich habe viele gleichgeschlechtliche Freunde. | 1 | 2 | 3 | 4 | 5 |
| Ich zweifele fast nie an meiner eigenen Intelligenz. | 1 | 2 | 3 | 4 | 5 |
| Ich habe Menschen, an die ich mich wenden kann. | 1 | 2 | 3 | 4 | 5 |
| Ich bin sehr gut darin, meine Gedanken und Gefühle durch Kunst oder Musik zum Ausdruck zu bringen. | 1 | 2 | 3 | 4 | 5 |
| Ich fühle mich allein. | 1 | 2 | 3 | 4 | 5 |
| Mit Kunst oder Musik kenne ich mich gut aus. | 1 | 2 | 3 | 4 | 5 |
| Alles in allem habe ich ein sehr positives Bild von mir. | 1 | 2 | 3 | 4 | 5 |
| Ich fühle mich sozial ausgeschlossen. | 1 | 2 | 3 | 4 | 5 |
| Ich habe Menschen, die mir nahe stehen. | 1 | 2 | 3 | 4 | 5 |
| Meine Eltern haben mich gerecht behandelt als ich jung war. | 1 | 2 | 3 | 4 | 5 |
| Der herzliche Umgang mit Personen des anderen Geschlechts fällt mir leicht. | 1 | 2 | 3 | 4 | 5 |
| Meine Eltern verstehen mich. | 1 | 2 | 3 | 4 | 5 |
| Ich habe Menschen, mit denen ich sprechen kann. | 1 | 2 | 3 | 4 | 5 |
| Ich betrachte mich selbst als äußerst begabt. | 1 | 2 | 3 | 4 | 5 |
| Es war oft schwierig für mich mit meinen Eltern zu reden. | 1 | 2 | 3 | 4 | 5 |
| Es fällt mir leicht zu verstehen, was durch Kunst oder Musik zum Ausdruck gebracht werden soll. | 1 | 2 | 3 | 4 | 5 |
| Ich bin zu viel allein. | 1 | 2 | 3 | 4 | 5 |
| Ich schließe nicht schnell Freundschaften mit Personen des anderen Geschlechts. | 1 | 2 | 3 | 4 | 5 |

## 7.4 Interaction Quality Questionnaire

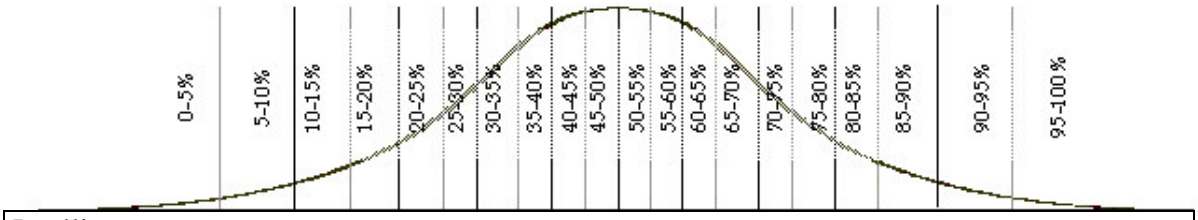
| Construct | Items | |
|---|---|---|
| Mutual understanding | *Interviewer* | *Interviewee* |
| | Ich konnte gut nachvollziehen, warum der befragten Person die besprochenen Lebensbereiche so wichtig sind | Die andere Person konnte gut nachvollziehen, warum mir die besprochenen Lebensbereiche so wichtig sind |
| | Es ist der befragten Person gelungen, mir zu erklären, welche persönliche Bedeutung die besprochenen Lebensbereiche für sie haben | Es ist mir gelungen, der fragenden Person zu erklären, welche persönliche Bedeutung die besprochenen Lebensbereiche für mich haben |
| | Die befragte Person hatte in der Unterhaltung wenig Gelegenheit, die Hintergründe zu erläutern, warum ihr bestimmte Lebensbereiche wichtig sind | Ich hatte in der Unterhaltung wenig Gelegenheit, die Hintergründe zu erläutern, warum mir bestimmte Lebensbereiche wichtig sind |
| | Ich zeigte der anderen Person, dass ich verstand, was sie sagte [a] | Die andere Person zeigte mir, dass sie verstand, was ich sagte [a] |
| Empathic ability of Interviewer | Ich habe oft Dinge gesagt, die wenig zum Gespräch beitrugen [a] | Die andere Person hat oft Dinge gesagt, die wenig zum Gespräch beitrugen [a] |
| | Ich zeigte der anderen Person, dass ihre Kommunikation effektiv war [a] | Die andere Person zeigte mir, dass meine Kommunikation effektiv war [a] |
| | Ich zeigte der anderen Person, dass ich viel Interesse hatte an dem, was sie zu sagen hatte [a] | Die andere Person zeigte mir, dass sie viel Interesse hatte an dem, was ich zu sagen hatte [a] |
| | Es fiel mir manchmal schwer, mit meinen Fragen an die Gedankenwelt der befragten Person anzuschließen | Es fiel der anderen Person manchmal schwer, mit ihren Fragen an meine Gedankenwelt anzuschließen |
| Interaction flow | Diese Gesprächshälfte verlief reibungslos [a] | |
| | Ich habe die Unterhaltung nicht genossen [a] | |
| | Ich war sehr unzufrieden mit dem Gespräch [a] | |
| | Ich habe diese Gesprächshälfte als locker und unverkrampft wahrgenommen | |
| Comfort | Ich fühlte mich während des Gespräches entspannt | |

[a] Adapted from Hecht (1978)

## 7.5 Single-Item Intelligence Rating Instrument

Wir möchten Sie bitten, die Intelligenz Ihrer Kontaktpersonen einzuschätzen. Bevor wir zu den einzelnen Einschätzungen kommen, erläutern wir kurz die Skala.

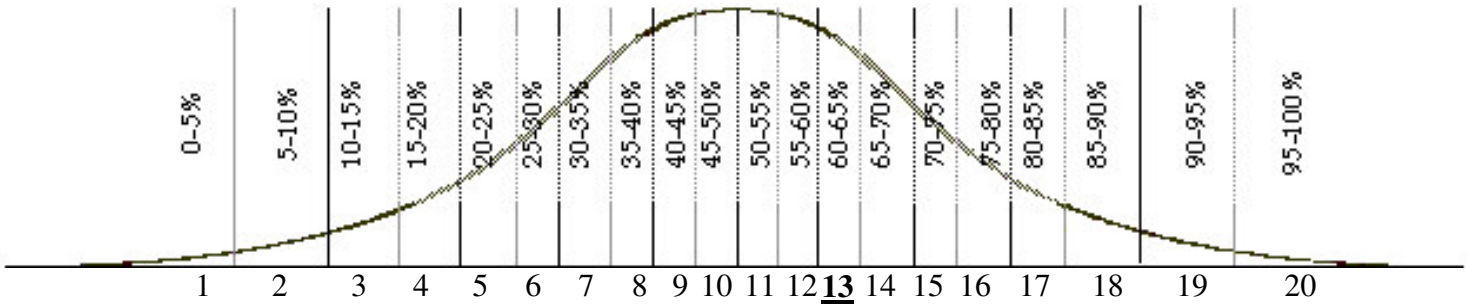
Gehen Sie bei den folgenden Einschätzungen davon aus, dass im Allgemeinen die meisten Personen eine mittlere Intelligenz besitzen, wenige Personen eine hohe bzw. niedrige Intelligenz und sehr wenige Personen haben eine sehr hohe bzw. sehr niedrige Intelligenz. Dieser Sachverhalt wird grafisch durch die folgende Kurve illustriert:




| Intelligenz | | | | |
|---|---|---|---|---|
| **Sehr niedrig** | niedrig | mittel | hoch | sehr hoch |

Im Folgenden bitten wir Sie einzuschätzen, wo Sie die intellektuellen Fähigkeiten Ihrer Kontaktpersonen im Vergleich zu den durchschnittlichen Fähigkeiten dieser Altersgruppe einordnen würden. Vergleichen Sie Ihre Kontaktpersonen also mit dem Bevölkerungsdurchschnitt und nicht ausschließlich mit Personen aus dem persönlichen Umfeld von Ihnen oder der jeweiligen Kontaktperson.

Um Ihnen die Aufgabe der Selbsteinschätzung zu erleichtern, haben wir Prozentzahlen angegeben, wie viele Menschen in der Allgemeinbevölkerung einen bestimmten Fähigkeitswert oder einen niedrigeren erreichen. Betrachten Sie zum Beispiel die folgende Grafik:




Wie Sie sehen, ist eine Einschätzung von 1 bis 20 möglich, wobei 1 einer sehr niedrigen, 20 einer sehr hohen Intelligenz entspricht. Jede Zahl entspricht einem Prozentwert. Die Zahl 13, wie hier als Beispiel markiert, bedeutet, dass Sie die Fähigkeit Ihrer Kontaktperson so einschätzen, dass diese ungefähr 60-65% der Vergleichsgruppe übertrifft, und dass gleichzeitig 35-40% der Bezugsgruppe über eine höhere Fähigkeit verfügen als diese Kontaktperson.

## 7.6 Summary of Studies Assessing the Validity of Intelligence Self-Ratings

| Study | Target sample | Intelligence test | *r* |
|---|---|---|---|
| Bailey & Lazar (1976) | 40 students | Concept Mastery Test / WAIS-similarities | .37 |
| Bailey & Mettetal (1977a) | 20 students + spouses | Otis-Quick Test of Mental Ability | .42 |
| Bailey & Mettetal (1977b) | 44 students | Otis-Quick Scoring Test of Mental Ability | .40 |
| Borkenau & Liebler (1993) | 100 non-students | Leistungsprüfsystem (subtests 1-6, 8 and 9) | .32 |
| Furnham & Fong (2000) [a] | 172 students | Raven's Progressive Matrices | .19 |
| Furnham & Rawles (1999) [a] | 193 students | S&M test of mental rotation | .16 |
| Paulhus et al. (1998) [b] | 636 students | Wonderlic Personnel Test | .22 |
| Paulhus & Morgan (1997) | 103 students | Wonderlic Personnel Test | .35 |
| Schmitt & Strein (1987) [c] | 34 people [c] | WAIS-R | .11 |
| Average [d] | | | .29 |

[a] Cited in Furnham (2001), [b] After 7 weekly group meetings, [c] Average of the range of reported correlations; nature of sample unspecified, [d] after Fisher *r*-to-*z* transformation and back-transformation

# 7.7 Numerical Intelligence Test

Bei diesem Test sollen Sie Zahlenreihen fortsetzen.

Die Aufgaben bestehen immer aus 7 Zahlen. Ihre Aufgabe ist es, die beiden folgenden Zahlen herauszufinden und anstelle der Fragezeichen einzusetzen.

**Hier eine Beispielaufgabe**:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | ? | ? |

Die Regel ist hier zu jeder Zahl 2 hinzuzählen um die nächste Zahl zu erhalten. Anstelle der Fragezeichen müßten die Zahlen 16 und 18 stehen.

**Hier eine zweites Beispiel**:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 3 | 5 | 8 | 12 | 17 | 23 | ? | ? |

Die Regel ist hier, daß nach jeder Zahl eins mehr hinzugezählt wird. Also erst +1, dann +2, dann +3, dann + 4 usw. Die beiden folgenden Zahlen lauten daher 30 und 38.

Alle Zahlen, die Sie herausfinden müssen, sind ganze Zahlen und größer als Null.

**Bitte tragen Sie die Lösung die Sie für richtig halten anstelle der Fragezeichen ein**.

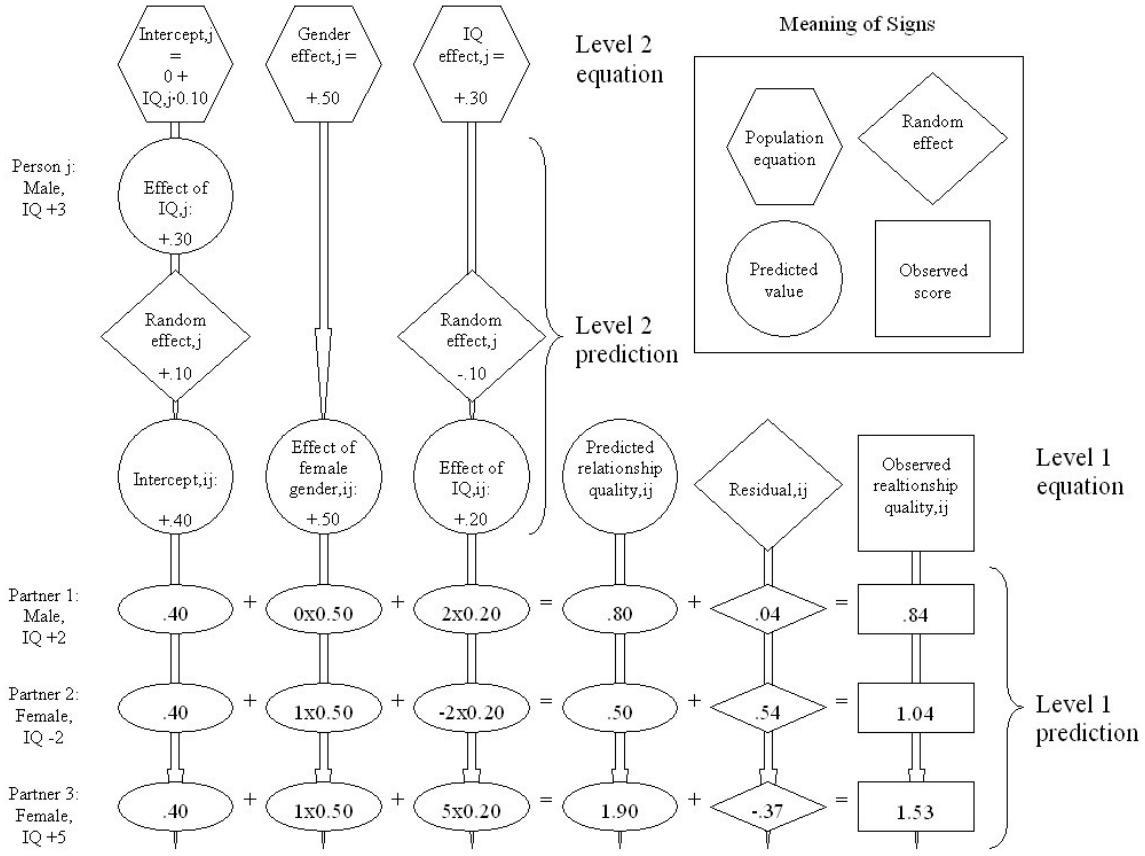
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 13 | 14 | 16 | 17 | 19 | 20 | 22 | ? | ? |
| 8 | 10 | 7 | 9 | 6 | 8 | 5 | ? | ? |
| 2 | 5 | 10 | 13 | 26 | 29 | 58 | ? | ? |
| 42 | 41 | 38 | 37 | 34 | 33 | 30 | ? | ? |
| 5 | 2 | 6 | 3 | 9 | 6 | 18 | ? | ? |
| 1 | 3 | 6 | 18 | 36 | 108 | 216 | ? | ? |
| 4 | 16 | 8 | 32 | 16 | 64 | 32 | ? | ? |
| 5 | 25 | 30 | 6 | 30 | 35 | 7 | ? | ? |
| 20 | 80 | 76 | 19 | 76 | 72 | 18 | ? | ? |
| 8 | 9 | 7 | 10 | 6 | 11 | 5 | ? | ? |
| 3 | 5 | 9 | 17 | 33 | 65 | 129 | ? | ? |
| 4 | 2 | 6 | 2 | 10 | 4 | 28 | ? | ? |
| 4 | 8 | 6 | 18 | 15 | 60 | 56 | ? | ? |
| 3 | 5 | 10 | 8 | 11 | 33 | 30 | ? | ? |
| 3 | 21 | 4 | 24 | 8 | 40 | 25 | ? | ? |
| 4 | 5 | 10 | 7 | 11 | 55 | 49 | ? | ? |

## 7.8 Short Version of the German General Interests Structure Test

Der folgende Teil des Fragebogens besteht aus einer Liste mit verschiedenen Tätigkeiten. Geben Sie bitte für jede einzelne davon an, wie sehr diese Sie interessiert bzw. interessieren würde.

| | gar nicht | wenig | etwas | ziemlich | sehr |
|---|---|---|---|---|---|
| Mit Maschinen oder technischen Geräten arbeiten | ○ | ○ | ○ | ○ | ○ |
| Sich mit unerforschten Dingen beschäftigen | ○ | ○ | ○ | ○ | ○ |
| Etwas nach künstlerischen Geschichtspunkten gestalten | ○ | ○ | ○ | ○ | ○ |
| Andere Personen betreuen oder pflegen | ○ | ○ | ○ | ○ | ○ |
| Andere von etwas überzeugen oder etwas veranlassen | ○ | ○ | ○ | ○ | ○ |
| Geschäftsbriefe schreiben | ○ | ○ | ○ | ○ | ○ |
| Konstruktionspläne zeichnen | ○ | ○ | ○ | ○ | ○ |
| Chemische, physikalische oder biologische Versuche durchführen | ○ | ○ | ○ | ○ | ○ |
| Dinge tun, bei denen es auf Kreativität und Phantasie ankommt | ○ | ○ | ○ | ○ | ○ |
| Sich die Probleme anderer Menschen anhören | ○ | ○ | ○ | ○ | ○ |
| Mit anderen Menschen verhandeln | ○ | ○ | ○ | ○ | ○ |
| Angebote einholen und vergleichen | ○ | ○ | ○ | ○ | ○ |
| Elektrische Geräte oder Anlagen bauen | ○ | ○ | ○ | ○ | ○ |
| Die Ursache eines Problems erforschen | ○ | ○ | ○ | ○ | ○ |
| Etwas mit sprachlichen Mitteln künstlerisch gestalten | ○ | ○ | ○ | ○ | ○ |
| Hilfsbedürftige Kinder oder Erwachsene betreuen | ○ | ○ | ○ | ○ | ○ |
| Das Amt des Sprechers in einer Gruppe übernehmen | ○ | ○ | ○ | ○ | ○ |
| Eine Abrechnung kontrollieren | ○ | ○ | ○ | ○ | ○ |

## 7.9 Schematic Depiction of HLM Analysis Logic




*Note*. Hierarchical linear modeling distinguishes between multiple hierarchical levels of data analysis. In the example, two levels are depicted. Level 1 concerns relationships assessed with an ego-centered social network instrument. These relationships are nested within participants at Level 2 (because participants have multiple relationships). HLM first estimates a separate (intra-individual) regression equation for every Level 2 unit (i.e., participants), using all available relationship-specific Level 1 data (Level 1 equation). This equation predicts the quality of relationships with individual network partners by means of an intercept (baseline level of relationship quality) and Level 1 predictor variables (in this case, gender and rated intelligence of a network partner). In the example, the predicted relationship quality for network partner 1 is .80: This value is obtained because this person is a male with an intelligence *z*-score of 2, so a value of .40 (2 x .20 = intelligence effect + 0 x .50 = gender effect) is added to the intercept of .40. The difference between this predicted value and the observed relationship quality constitutes the Level 1 residual (random effect). On Level 2, participant-specific information can be used to predict the

parameters of the Level 1 equation. For this, a population equation is specified that allows Level 1 parameters to vary according to participant-specific Level 2 variables. For example, the slope of the association between participants' IQ *z*-score and the Level 1 intercept is .10. Because the participant in the example has a *z*-score of 3, his or her intercept is 3 x .10 = .30 higher than the average population intercept of .10. Thus, a Level 1 intercept of .40 is obtained for this person. When parameters in the Level 1 equation are allowed to vary between different participants (independent of other Level 2 variables), this constitutes a random effect (depicted by the triangles in the figure). When a Level 1 parameters is not allowed to vary, it is called a fixed effect (e.g., the slope of the association between gender and relationship quality).

# Curriculum Vitae

**Persönliche Daten:**

| | |
|---|---|
| Name: | Jacobus J. A. Denissen |
| 14. Februar 1978 | geboren in Udenhout, den Niederlanden |

**Schulausbildung:**

| | |
|---|---|
| 09/1982-07/1990 | Grundschule in Udenhout (Niederlande) |
| 09/1990-07/1996 | Gymnasium in Tilburg (Niederlande), Abitur |

**Hochschulstudium:**

| | |
|---|---|
| 09/1996-12/2000 | Studium der Psychologie an der Universität Nijmegen (Niederlande) |
| 01/2001 | Abschluss: MA Psychology |

**Klinische Berufserfahrung:**

| | |
|---|---|
| 02/2001-09/2001 | Psychologe, Klinik am Korso, Bad Oeynhausen |

**Wissenschaftliche Mitarbeit:**

| | |
|---|---|
| seit 11/2001 | Doktorand am Lehrstuhl Persönlichkeitspsychologie<br>Humboldt-Universität zu Berlin |